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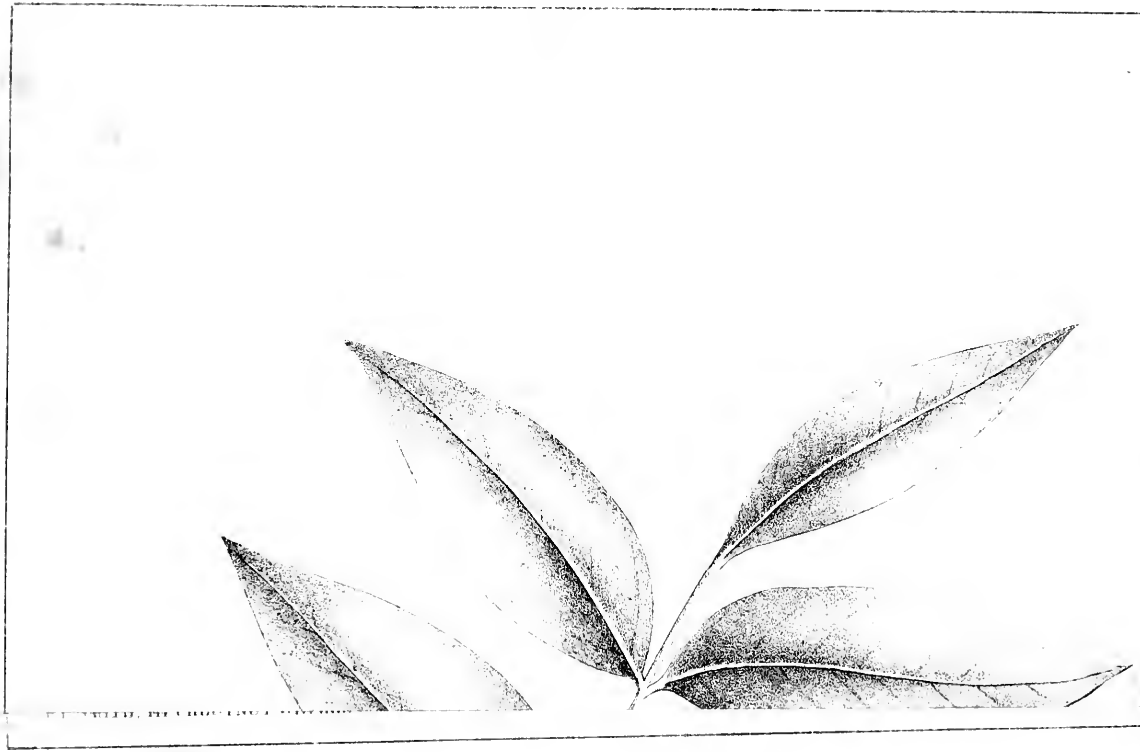

QUASSIA EXCELSA.

P. S. SMITH 141 CHESTNUT ST. PHIL.

QUASSIA EXCELSA.

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JANUARY, 1849.

ART. I.—ON QUASSIA EXCELSA.

By J. CARSON, M. D.

(*With a Plate.*)

THE LOFTY BITTER-WOOD TREE.

QUASSIA EXCELSA. PICRÆNA EXCELSA—*Lindley.* PICRANIA AMARA—*Wright.* SIMARUBA EXCELSA—*De Candolle.* QUASSIA POLYGAMA—*Lindsay.*

SEX. SYST.—*Decandria monogynia.*

This plant has been made the basis of a new genus by Lindley, and of one by De Candolle, who has included another plant with it. Where generic characters which would place it with Quassia fail, it happens apparently, by abortion, and we have preferred to retain the old name of Swartz. The sexual arrangement is difficult. From the unisexual flowers of both kinds produced by abortion, intermingled with the hermaphrodite, it should be located in Polygamia, Monœcia. The use of this class, however, has been abandoned by most botanists, and we have specified in the appropriate place the class and order of the genus Quassia.

GEN. CHAR., as given by Lindley, is the following: *Flowers* polygamous. *Sepals* five, minute. *Petals* five, longer

than the sepals. *Stamens* five, about as long as the petals, rather shaggy; *anthers* roundish. *Ovaries* three, seated on a round, tumid receptacle. *Style* three-cornered, trifid; *stigmas* simple, spreading. *Fruit* three, globose, one-celled, two-valved drupes, which are distinct from each other, placed on a broad, hemispherical receptacle.—(*Flor. Med.*)

Spec. Char. A tree fifty to sixty feet high, with the branches spreading, the bark rimose, ash-coloured. *Leaves* alternate, impari-pinnate; leaflets opposite, shortly petioled, oblong acuminate, unequal at the base, blunt at the apex, venose, glabrous. *Racemes* towards the ends of the branchlets axillary, very compound, panicled, sub-corymbose, dichotomously branched, spreading, diffuse, many-flowered. *Peduncles* compressed, rufescent, downy. *Flowers* small, pale, polygamous. *Filaments* of the male flower much larger than the petals; in the fertile, of the same length. In the male merely the rudiments of the pistil; in the fertile, *ovaries*, three; *style*, longer than the stamens, three-quetrous, trifid. *Drupes* three, but only one coming to perfection, the size of a pea, black, shining, fixed on a hemispherical receptacle; *nut* solitary, globose, with the shell fragile. (*Macfadyen.*)

In Jamaica, where it is abundant, the plant is called *Bitter-ash* and *Bitter-wood*; it grows in the mountains of this island, and others appertaining to the West Indies.

In 1791, a paper, by Mr. John Lindsay, Surgeon in Westmoreland, Jamaica, was read before the Royal Society of Edinburg, (see Vol. iii. *Trans.*,) in which he called the tree *Quassia Polygama*. Sir Hans Sloan, who called at Barbadoes, noticed the *bitter wood*. In his Catalogue he described it thus: *Melanomma* et *Melanoxylon*, arbor lancifolia, *gemmis nigricantibus*, Americana. He refers to Plankenet, Tab. 205, p. 3, which plant (*Simaruba*) Lindsay says is different from his. Dr. Patrick Brown and Mr. Long mention the tree in their Histories of Jamaica, by the

name *Xylopicrum*, *Xylopia glabra*, *Bitter* wood and *Bitter* ash.

Dr. Wright, in his account of the medicinal plants of Jamaica, bestowed the name *Picrania amara.*

This wood is imported in billets, covered with the smooth grayish, sometimes silvery bark. It is white, light, and even in its texture, but becomes darker from exposure. The taste is intensely bitter. It contains the peculiar bitter principle, *Quassin*, as well as of volatile oil a minute trace, gummy extractive, pectin, woody fibre and salts, of which nitrate of potassa is most prominent.

Quassin was first isolated by Thomson, of Glasgow. It occurs in small, white, prismatic crystals, fusible, odourless, intensely bitter, readily soluble in alcohol, but slightly so in water or ether. Its solubility in water is increased by several salts and vegetable principles. Its watery solution is precipitated white by tannin, but not by iodine, chlorine, corrosive sublimate, salts of iron, acetate or diacetate of lead. It is a neutral body, though soluble in sulphuric and nitric acids. Its composition is $C^{10} H^{6} O^{3}$.—*Wrigger's Ann. der Pharm. and Pereira's Mat. Med.*

The medical effects are those of a pure bitter, tonic and roborant, and as such Quassia-wood is used in convalescence, dyspepsia, &c. The mode of exhibition is in cold infusion, made from the chips or raspings, in tincture or extract. In France it is a practice to have cups turned from the wood, and to allow water to stand in them until it becomes imbued with the active principle.

The wood is excellent timber, takes a polish, and is used in flooring; it is so obnoxious to insects, that furniture is sometimes made of it, as, for instance, bedsteads and clothes' presses.—*Macfadyen.*

Fee informs us that upon the bark of this tree he has found thirteen parasites, while upon that of the *Q. amara* he has found but one, and that not a lichen. The wood was confounded with that of the *Q. amara*, until the source

of it in large billets was pointed out by Lamark in France and Lindsay in England.

In France an insipid wood is said to be substituted for the genuine.

ART. II.—PHARMACEUTICAL OBSERVATIONS.

By R. H. Stabler, of Alexandria, Va.

Iodide of Potassium.

The difficulty experienced in my first efforts to prepare this salt pure, and free from colour, by the adopted formula of our Pharmacopœia, has led me to examine each of the processes by which it is prepared, in order to select one capable of furnishing a uniformly good article, easy of execution, and attended with as little loss of material as possible.

The pharmaceutist finds it difficult to execute the United States process, owing to the necessity of first forming an iodide of iron, which is to be exactly decomposed by the solution of carbonate of potassa; to do this requires much care, and even when accomplished he will find the product very apt to be coloured by a portion of adhering oxide of iron of which it cannot be wholly freed unless exposed to a dull red heat, dissolved, filtered, and re-crystallized, thus rendering it necessary to multiply the number of steps to the process.

The London and Edinburgh processes have several objectionable points, which are fully commented on in the United States Dispensatory and need not be mentioned further here.

The mode of preparing this salt which I would submit,

is modified from that mentioned by Pereira as having been proposed by the late Dr. Turner, and has yielded the best results in my hands; it is as follows:—

Saturate a hot, freshly prepared solution of potassa, with iodine added in small quantities at a time, and stirring well after each addition, until the liquid shows a slight excess of iodine, by the reddish colour imparted—evaporate the solution and mix the resulting salt with about an eighth of powdered charcoal, and subject it to a dull red heat in a common iron pot; the iodide is next dissolved out of the residue, the solution filtered, and on evaporation yields a perfectly pure salt.

The iodide prepared as above gave no trace of carbonate of potassa, chlorides, sulphates or iodates; the pure salt is deliquescent as it slowly liquifies when exposed to the air.

Liq. Ferri Iodidi.

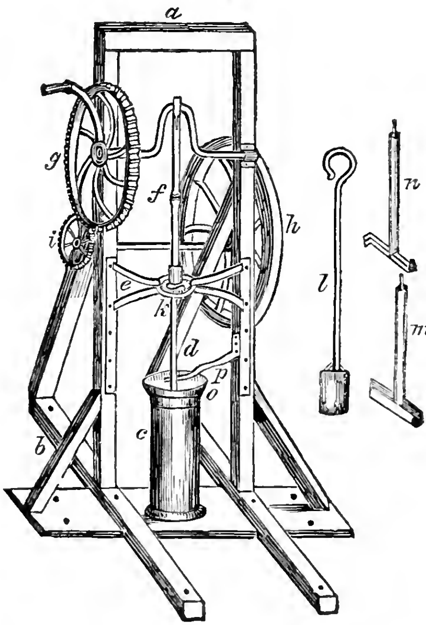
In preparing the Liquor Ferri Iodidi, it is important to observe that none but the best American honey should be used, as the Cuba honey which is the kind generally met with in the shops, does not effectually protect the solution from change.

Tinctures.

Small quantities of vegetable tinctures may be prepared in a few minutes when wanted for prescriptions, by reducing the root or leaves to moderately fine powder, and boiling for a short time in the requisite quantity of alcohol; the tincture should then be allowed to cool before filtering, in order that all substances not soluble in cold alcohol may be deposited. This process requires less time for its execution than that of displacement.

ART. III.—REPORT TO THE COLLEGE OF PHARMACY ON A MACHINE FOR MAKING MERCURIAL PILL MASS, INVENTED BY J. W. W. GORDON, of Baltimore. Read and adopted at the Pharmaceutical meeting held December 18th, 1848.

In order to make the report of the Committee intelligible, we have had prepared a wood cut representing the apparatus of Mr. Gordon, and append a short description of its parts.—[Editors.



a, b. Is a solid frame of wood about 5 feet in height.

c. A cast iron cylinder 7 inches in diameter and 16 inches deep, in which the materials are placed.

d. The piston and knife, in position.

e. The guiding plate and arms, with the plates on which it slides, attached to the frame work.

f. The connecting rod communicating the motion from the crank to the guide plate and piston.

g. The large cog-wheel attached to the crank 19 inches in diameter, with an arm to which the handle is fastened.

h. The fly-wheel—to regulate the motion of the machine, to which a handle is attached. This wheel is placed on the same axle with a small cog-wheel,

i. Which communicates with the large cog.

k. Is a revolving plate attached to the guide-plate, the circumference of which is armed with teeth. The brass cap of the connecting rod which connects it with the guiding plate, is furnished with projecting arms, which press alternately against two palls catching in the teeth of the revolving plate, which palls are kept in position by two semi-circular springs attached to the guide-plate on either side. The motion of the connecting rod back and forth occasioned by the revolving crank, causes the arms of the cap to press against the palls, and thus force around the revolving plate. The piston is screwed into this from beneath, and consequently revolves with it six revolutions of the crank, affecting one of the piston. (The engraving is defective at this point, and does not convey a correct idea.)

l. Is an iron spade curved to suit the cylinder, and used for removing the mass.

m. The two-bladed knife, the outer sides being bevelled; the inner flat; the blades being abont 3-16ths of an inch thick at the centre.

n. Is the one-bladed piston. This blade is constructed like those just described, except that the ends of the knife are turned in opposite directions about 3-8ths of an inch.

o. Is a tinned iron funnel-shaped rim, which fits closely on the top of the cylinder, and is intended to prevent waste by the lifting effect of the knives at the beginning of the process.

p. Is a movable scraper attached to the wooden frame-work, and pressing slightly against the piston rod or knife-handle, and which is intended to keep it free from the mass.

When the full charge of ingredients, thirty pounds, is introduced into the cylinder, the handle is attached to one of the spokes of the fly-wheel, and the power then applied till the materials are mixed to a certain degree. The quantity is then reduced to one-fourth, and the power applied to the handle or the large cog-wheel. It is necessary that the machine be fastened firmly to the floor.

To the Philadelphia College of Pharmacy :

The Committee appointed to witness the operation of J. W. W. Gordon's apparatus for making blue mass, and to examine the product afforded by it, report as follows:

Having made an arrangement with Samuel F. Troth & Co., who kindly offered to facilitate the views of the Committee by accommodating the apparatus at their warehouse ; and the ingredients for thirty pounds of mass having been obtained of good quality, viz. ten pounds of mercury, fifteen pounds of conserve of hundred-leaved roses, and five pounds of powdered liquorice root ; the inventor commenced operations by placing the mercury in the cylinder, then throwing in all the conserve but two pounds ; on this the powdered liquorice was placed, and lastly the remaining conserve. The object of this last addition is to prevent the waste of the liquorice powder.

The two-bladed knife is then attached to the guide-plate. The scraper screwed in its place, and the machine put in motion ; the power being applied to the handle on the fly-wheel, which necessarily rendered the motion of the piston very slow. This action was continued for two hours, when the greater part of the metal was disseminated through the mass, though the globules were mostly visible. The contents of the cylinder were now removed, and then divided into four parts, that taken from the bottom having most mercury in it ; one-fourth of each of these quarters was placed in the cylinder, the handle attached to the larger cog-wheel, the single-bladed piston screwed in place, and the power applied. The piston moves with nearly five times the rapidity in this case, and was suffered to run twenty minutes, when the mass was removed and another charge introduced, composed in the same manner of each of the quarters, which was treated for twenty minutes as before ; the remaining portions were successively subjected to the action of the knife for the same length of time. When examined, the mass had changed in colour to a bluish cast, and the mercury was sufficiently divided to be hardly

visible to the eye. The whole was then kneaded as bread dough for a few minutes, and divided into four portions, each seven and a half pounds, one of which was put into the cylinder and operated on with the single knife piston for twenty-five minutes, when it was removed, and another charge introduced in the same manner. This was repeated on each of the other quarters for the same time. By this third treatment the mass had acquired the ordinary colour of blue mass, though not so dark as usual; the mercury was invisible to the unassisted eye, and but slightly with a common lens. The quarters were again sub-divided as before, and the machine kept in motion for half an hour on each fourth, the single knife being used. The mass now had the proper bluish-grey colour, was smooth and uniform in texture, and when examined with a lens, but slight traces of mercury globules were visible, not more than are frequently observable with a glass of the same power, in the commercial mass. The inventor was of opinion that the mass should be treated once more for half an hour on each quarter, which was accordingly done, when he pronounced the mass finished. Owing to the method adopted of operating on one-fourth at a time, the actual period during which the machine was in motion in finishing the whole 30 lbs. exceeded that prescribed by the inventor, amounting in all to nine hours, but if the delays occasioned by removing the mass be added, the time will be 3 hours more. But the actual time required to have finished any fourth of it would be 3 hours and 45 minutes. The reason for operating on a fraction was that the power of one man is insufficient to turn the crank axle, with the whole quantity in the cylinder, and if the power is applied to the other axle, the motion of the piston is too slow to affect the object within the time specified.

Analysis.—The products of the last four operations of the machine were each submitted to analysis by the plan of Dr.

Reid; 50 grs. of mass mixed with 10 grs. of iron filings, was put in a bulb blown on the end of a tube; the tube dipped into a wide-mouthed vial containing a portion of alcohol, and heat applied, until the bulb became red hot, and continued until all the mercury was driven over. The mercury, together with the empyreumatic oil, is condensed in the tube, and run down into alcohol, which dissolves the latter, the metal remaining intact. It is washed with alcohol several times, and then thrown on a weighed filter, and when dry its quantity ascertained. The result was as follows:

1st	quarter	yield	per 100 grs.	=32	grs.	of mercury.
2d	"	"	"	32	"	"
3d	"	"	"	32½	"	"
4th	"	"	"	33	"	"

From these essays it is certain not only that the mass contained the requisite amount of mercury in the aggregate, but it was uniformly disseminated throughout the whole mass—as the quantities yielded by the several analyses correspond as nearly as under the circumstances could be expected.

Action of the Machine.—As the surface producing the friction or mixing action is so small, the committee were very skeptical of the powers of the machine to effectually disintegrate the mercury and disseminate it through the mass; but the opportunity they have had of witnessing its action, has convinced them that it is perfectly competent to divide the mercury and mix it. The inventor is of opinion that the globules of mercury are bisected by the knife, and hence he believes that the machine acts more rapidly when the mass is stiffer, because then it offers greater resistance to the knife, and the globules are not pushed aside without being cut through. Whether this opinion is the correct one or not, it is certain that the stiffness of the mass has very much to do with the rapidity of the process. The knives act both up and down, as they are bevelled to a sharp edge either way on one side, and flat on the other, and this

bevelling is sufficient to produce a pushing and lifting effect on the mass ; the knife never rises and falls in the same place, at any two consecutive movements, but is continually revolving about six revolutions of the crank, producing one in the knife. Every part of the contents of the cylinder is visited by its effects. The mass is not exposed to the action of the air in this machine to the same extent as it is in the triturating process, nor is there so great a surface for evaporation. It is believed that the colour of blue mass becomes darker by age, a change due possibly to an oxidizing action exerted on the surface of the minute globules. The colour appears to darken with the minuteness of the globules, or state of division of the mercury also, because every succeeding operation of the machine caused the colour to deepen ; and the inventor says that by continuing its action for a length of time, the colour may be made considerably darker than the mass as finished under our observation. During the progress of the experiment as before stated, the committee took the precaution to set aside a sample of each quarter of the mass in each of the operations. In subsequently comparing these under a good lens, the gradual progress of the division of the mercury is very apparent, until in the finished article the globules are barely visible, and when compared with a mass of acknowledged good quality, made by the triturating process, the degree of division was equally great, if not greater, and fewer instances of separate larger globules, as are often found in mass.

The fibrous texture of the conserve is reduced to a uniform state by the cutting action of the knife which is very sensibly visible on comparing the earlier with the later samples of the mass.

In reviewing the operation, we are of opinion that the power of one man is not sufficient to turn the machine with its full charge, with that rapidity requisite to make the pill mass in six hours. We believe that it is much better adapt-

ed to the constant power derived from steam when the motion can be continued until the mass was finished, without the delay and trouble of removing it so frequently from the cylinder which also occasions loss, yet with a smaller charge, say ten pounds, they think the machine fully adequate in five hours to finish it when turned by hand, and consequently that it will prove extremely useful in the hands of those druggists who may desire to prepare their own mass. It would probably be to the advantage of the inventor to make a size smaller in which the cylinder will be of less height and the arm of the crank consequently shorter, proportioned to the shorter stroke of the piston, which would give the operator more power and make the removal of the mass less difficult. Another size might be made for the manufacturer capable of acting on a charge of 100 lbs., the force being derived from steam or other power; and as a few hours more or less is of little consequence in this case, there would probably be great advantage from using the machine 10 or 12 hours instead of six.

In conclusion the committee would observe that this apparatus is a very valuable addition to the pharmaceutical laboratory, as it places within the reach of every druggist a means of making blue pill mass of good quality within a reasonable time.

They therefore would recommend the apparatus to the favorable consideration of the College, and believe it worthy of the adoption of those members of the profession who wish to manufacture their own mercurial pill mass.

William Procter, Jr.
Thos. P. James,
Wm. J. Jenks,
Ambrose Smith,
Edward Parrish,
John H. Ecky,

Philadelphia, Dec. 18th, 1848. *Committee.*

ART. IV.—ON THE CULTIVATION OF OPIUM IN ARMENIA, Translated and condensed from the French of M. H. GAULTIER DE CLAUBRY. By EDWARD PARRISH.

IT has been found by repeated experiments that in some tropical countries, opium may be cultivated to great advantage, whilst in others, as the district of Aiden, where its cultivation is extensively practised, it is unprofitable, the juice of the poppy, when extracted, being so thin as to furnish a feeble product, or be lost by running down the plant upon the ground.

This difficulty is attributed, among cultivators, to various causes; by some to the dampness of their fields, by others to the exposure of their lands to the south, while some charge it to the excessive heat of the climate. Another source of difficulty is a deficiency of laborers in gathering the crop, from which it happens that some of the plants are too ripe and others not ripe enough at the time of extracting the juice.

In *Karra Hissar*, though the people possess considerable knowledge of this kind of culture, yet owing to a deficiency of water with which to irrigate the soil, the opium is black, and only one-twelfth the strength of the Armenian opium. The bombarders of Karra Hissar, in garrison at *Kaléi Sultanié*, use it, however, with advantage.

The poppy has been found growing wild at *Tékir Dagh* in a church yard near the sea; but although a little juice may be extracted by incision, it was found to be comparatively feeble and inert for want of cultivation. Although *Afion Karra Hissar* is the seat of the most successful production of opium, yet the desire and taste for its cultivation is extending rapidly over the surrounding country, and the zeal of the planters is crowned with success.

In *Emide*, which is a large town situated near *Tarchanle*,

excellent opium is produced, the price of which is high, and it is here that instructions in relation to its cultivation were obtained.

Influence of the soil.—Damp fields are not suited to the culture of opium by reason of the ice which is formed in winter mutilating the seed; it is also important that the ground should be dry at the time of the incision. The best soil is that which is always dry, *avide d'eau*, and which is so situated as to be readily watered, so that in the absence of rain it may be irrigated either during the ploughing, sowing, or afterwards. A hard and strong soil obstructs the free penetration of the root, and the plant and capsule are not fully developed, while a light gravelly or sandy soil, particularly that of a red colour, sufficiently manured, is best calculated for its successful cultivation.

Culture.—If the field is in a plain or on a mountain, and especially if the soil is already enriched by the manure of flocks of sheep, it is ploughed twice in the spring, and then left exposed to the rays of the summer sun, and to the rigours of the winter, until the following spring, when they plough it a third time, and sow the poppy seed. If the situation and character of the soil is favorable, and the weather fine, and if the cultivators are honest and experienced, an excellent variety of opium is obtained, which is called *Kez Afioni* (opium of the family.) The ground is not harrowed after sowing, as is the case with wheat and other grains, though some attach a bush to the plough by a cord, which is drawn after it so as to effect a light covering of the seed; the furrow is allowed to remain for shelter to the young and tender plants.

Varieties in the seed.—There are four species of poppy seeds found in Armenia, white, yellow, black, and blue. Of these each variety produces a different coloured flower, namely: that of the white seeds is lilly white; of the yellow red; of the black, black; and of the blue, a deep purple. The white and blue varieties of seed produce large capsules, a

little oblong in shape, the yellow and black produce small and perfectly round heads. The white seed are preferred by cultivators, being exceedingly oleaginous, and in demand for the manufacture of poppy oil. The yellow variety yields an abundance of the juice, and the black a heavy product. In some places the blue seeds are esteemed also.

The white and blue seed are sown near the house for the greater convenience of the peasant in cultivation.

Time of sowing.—Careful cultivators having assorted and selected the best seeds, sow them according to the following directions. The white and blue are sown on the plains, in a dry soil, about the end of September or beginning of October. The cultivator, however, failing a suitable occasion in the autumn, for want of rain, watches a favorable opportunity from the end of January till March, when if one occur, he sows the white and blue seed, or if not, he abstains.

The yellow and black seeds are sown in elevated and mountainous regions, and the most favorable time is about the beginning of April.

Before sowing, the seed are thoroughly mixed with ten times their weight of finely powdered and sifted earth; they are then scattered over the soil.

For a space of ground forty paces square, forty drachms of the seed suffice.

It is important that at the time of sowing, the ground should be neither too dry nor too moist. The most suitable state of the soil is that which occurs after the rains have ceased to inundate the fields and melt the ice; as the moisture then evaporates, the ground becoms soft and spongy.

Care and treatment of the plants.—When the plants have grown to the size of lettuce, the planters hoe around them with care, and on the appearance of weeds repeat the operation. If they grow too closely together, they pluck the most feeble, so as to leave between them a space of about a foot, (deux empans.) In about twenty days after-

wards, they hoe around them a third time. Though the weeds, when allowed to grow during the summer, suppress the growth of the plants and diminish the yield of juice from them, they are a protection during the rigours of the winter season. If the season is dry, the cultivators water the plants each time they hoe them, and if the soil is strong or heavy, they water them with great diligence till the time of flowering. When the plants have attained about three feet (one metre) in height, it is found necessary to prop some of them, as in some cases a number of stalks and as many as 35 capsules are produced from a single root.

Of the injuries besetting the plants.—Plants sown in the autumn are very liable to be injured by the frost; if, however, they are covered by snow, this difficulty is obviated. Those sown in the spring sometimes suffer from the same cause, especially when a white frost is followed by the hot sun; if rain supervenes, however, no injury is likely to result. After the plants have grown to the size of lettuce, they are not liable to injury from the frost. The young plants are also injured by exposure to the sun after a thick fog, the moist leaves being burned by the excessive heat. On this account it is desirable that the field should be situated at the foot of a mountain, so as to allow of the plant becoming dry after a fog or white frost, before being reached by the sun's rays. When the young plants are stunted or injured from these causes, careful cultivators plough the field again, and sow the seed a second time so as not to lose the entire season.

Manner of collecting the juice.—When the plants attain the height of 2 feet (*un archen*) the corolla expands; this is composed of four petals, which, after seven or eight days, dry up and fall, exposing the capsule, which is then about the size of a nutmeg, and goes on increasing from day to day. It is generally between the 20th of July and the middle of August that the plant has arrived at perfect maturity. The proper time for the extraction of the juice is deter-

mined by regarding the following indications. In the first place, it is observed that the leaves become yellow and the bright green of the capsules takes a reddish tinge; the operator then takes the precaution to incise a few of the capsules, and if the juice does not exude, or if it runs down the plant, or if the secretion is of a dark colour, he is assured that the proper time has not come:—But when he obtains a thick fluid, resembling milk in colour, he proceeds immediately to collect the crop, as the least delay after this time lessens the amount which may be gathered. Having taken these precautions, the operator enters the field at break of day, and turning himself toward the east, he incises the capsules to the end of the first side of the field, moving backward toward the other side, that the juice which exudes on incision may not be wiped off by his clothes. The part incised ought to remain exposed to the sun, therefore he continues in this position till noon, when he turns his face toward the west and continues the operation which is performed in the following manner. He introduces the index and middle finger of the left hand by the base of the corolla under the capsule, resting the thumb on the summit, and he incises across its breadth with his right hand, near the middle. The incision should be made carefully so as not to involve more than half the thickness of the capsule. If the incision is not deep enough, the juice does not flow; if too deep, it runs down within instead of exuding. If the incision is properly made, the juice appears soon afterwards, in tears, about the colour of milk or sometimes of a brown colour; the sun thickens it and imparts to it a red tint,

An instrument has been recently invented in Armenia for incision, resembling a lancet, with which a workman can operate with uniformity and precision with his eyes shut.

The next day the laborer resumes his operations upon the remainder of the capsules, and when the heat begins to be felt, if the atmosphere is without fog, proceeds to collect

the opium from those incised the day previous; this he does by drawing his knife over the line of the incision where the matter is collected; he thus collects on the knife the matter from one or from several heads, and deposits it on a leaf of the poppy; some use the leaf of the grape vine or other plant, although this practice is not generally approved. When he has collected a sufficiency, he wraps and compresses it in the leaf. The leaves that are used should be yellow, as the green leaf blackens the opium. It is also necessary to have the precaution not to use leaves which are so much dried as to break up when used. If the second day of the incision is foggy, the opium does not become dry, and is not collected till the following day, unless it should rain. Although the fog blackens the exudation, it does not injure its quality.

When gathered in very fine weather, the opium is in denticulated tears of a red colour. This is *Kez Afioni*, (the opium of the family,) produced only by four species of seed. The principal circumstance which contributes to the excellence of this opium, is the serenity of the weather, though a red soil and careful tillage contribute toward the production of a good article. The most favourable localities for opium are those which are the least foggy, by reason of constantly prevailing winds. Such are Emide and Giurez, and hence the fame of the opium of those countries.

Laborers who have not been accustomed to incising and collecting the juice, after being engaged at it some hours become intoxicated; cases of this kind are numerous and remarkable; it is observed also of infants at the breast, who are carried by their mothers to their work, that though placed at a distance from the field, and only occasionally visited and nursed by them, they often fall into a state of drowsiness, and sleep till night from the odour of the opium upon the clothes of the mother. These children sometimes grow up dull and stupid from the opium being too freely employed by their mothers when desirous of leaving them

alone for a long time, while at their work. In order to avoid this drowsiness while at their work, many labourers attach an onion cut in two in front of them, and carry another with them, which they smell occasionally. This is found to protect them from any such inconvenience.

From a single capsule they obtain a *grain* of matter; one *measure* of ground produces at most 3,750 *drachmes*, (Fr.) or 15 tchékis, 250 *drachmes* (Fr.) being estimated to our tchékis, though sometimes they are so unfortunate as to gather only one tchéki from that space.

After the extraction of the opium, the capsules are allowed to remain, in order to procure from them the seed. After a time they are cut off from the stalk and spread out upon the ground to dry; when a suitable occasion arrives, they are spread out and stamped upon till thoroughly broken up, the whole being then transferred to a large basin filled with water; the rinds float on the surface, and are thus separated from the seed, which are collected in the bottom of the vessel and preserved.

When the different species are mixed, and it is designed to separate them, it is necessary to puncture each capsule and ascertain the colour of the seed, and to divide them into separate portions before proceeding as above.

ART. V.—ON DRUG-GRINDING.

By Mr. Theophilus Redwood,
Professor of Chemistry and Pharmacy to the Pharmaceutical Society.

A large proportion of the solid substances employed in medicine, are submitted to certain processes by which they are reduced to powder, either as a preparatory step to subsequent pharmaceutical processes, or to fit them for administration in the solid state. It is, therefore, an interesting

and important question—whether, and to what extent, do the operations connected with the pulverization of drugs affect their composition, strength, and general medicinal efficacy?

Every druggist is familiar with the usual method of powdering drugs by the use of the pestle and mortar. This is the process usually adopted by the retail pharmaceutist. But the greater part of the drugs which are used in powder are reduced to that state previously to their passing from the wholesale dealers, and in these cases the process is generally conducted by persons who make it their special business, and who are called *drug-grinders*. The establishments at which drugs are thus reduced to powder, are called *drug-mills*, and the implements used there for effecting the disintegration of the drugs, are the *grinding-mill* and the *stamping-mill*.

The essential features of the means by which disintegration is effected at the drug-mills, are the same as those which characterize the more familiar processes of the druggist. In both cases comminution is effected by *contusion* and by *trituration*.

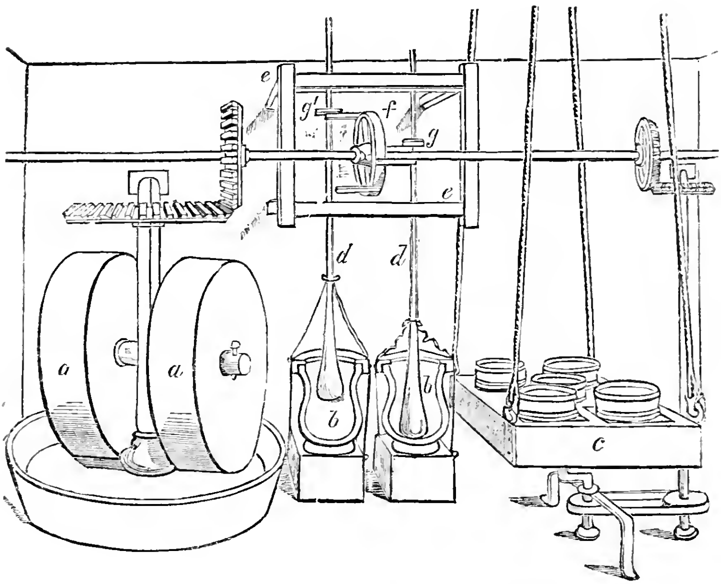
The druggist effects the pulverization of drugs *by contusion*, with a pestle and mortar made of some hard metal—either iron or bell-metal.

The drug-grinder also reduces drugs to powder, in some cases, *by contusion*, and his implements are the pestle and mortar, which differ but little from those used by the druggist. But the pestle and mortar of the drug-grinder is called a *stamping-mill* or stamper. The pestle, instead of being worked by manual labour, is raised by machinery, and allowed to fall with the impetus of its own weight, as shown at *d e f g* in the drawing at page 22. These pestles usually weigh from thirty to fifty or sixty pounds. These mortars, which, in common with the pestles or stampers are of iron, are not larger than those commonly used for powdering drugs with the spring pestle.

The druggist effects the pulverization of drugs *by trituration*, with a pestle and mortar, usually made of marble. Sometimes he uses the porphyry slab and muller, but this method of operating is of rare occurrence. There are also a few cases in which the substance to be powdered is merely rubbed over the surface of a sieve.

The drug-grinder also reduces drugs to powder *by trituration*, and this, indeed, is the principal mode of operating adopted at the drug-mills. But the apparatus employed by the drug-grinder for powdering by trituration, differs greatly from that used for a similar purpose by the druggist. The triturating implement of the drug-grinder, is usually called the drug-mill; when used for other purposes, it is sometimes distinguished as the pugging-mill. It consists of two stone cylinders, (*a a*) commonly called the runners, four or five feet in diameter, and 12 or 15 inches in thickness, which are trundled round a central beam working on a spindle. This mill is a most efficient instrument for effecting the comminution of drugs. The runners, which are made of granite or other hard stone, and usually weigh a ton or more, break down or tear asunder the hardest and toughest substances. The disintegration is effected partly by weight of the stone, and partly by the grinding or triturating action produced in consequence of the outer and inner edges of the revolving cylinder, which are both equal, being made to perform unequal circuits in the same time. Thus, if either of the cylinders were simply trundled without control, it would proceed in a straight line, but being made to describe a circle immediately around the central beam, the outer edge of the cylinder has to travel through a longer path than that assigned to the inner edge, so that every advance onwards, by which the weight or pressure is imposed upon a new surface, is accompanied by a lateral friction caused by the unequal progression of the two edges of the cylinder.

A drug-grinding room usually contains a pair of stones (*a a*), a set of five or six stampers such as *b b*, and a sifting apparatus (*c*).



APPARATUS FOR DRUG-GRINDING.

a a. The drug-mill.
b b. The stampers.
e e. The guiding-frame for stampers.
c. The sifting apparatus.

The sifting apparatus consists of a square wooden frame (*c*), in which there are five or six octagon-shaped holes for the reception of the sieves. This frame is suspended from the ceiling by four ropes or chains, and its peculiar motion is effected by a rotating crank working in a socket in the bottom of the frame. A very irregular and jerking motion is thus imparted to the frame, and from thence to the sieves, by the joint action of the revolving crank, and of the ropes by which the frame is suspended. The sieves employed in the process are the common drum sieves.

The first operation connected with the grinding of drugs consists of drying them. If they are in large masses, they are cut or broken into small pieces to facilitate the drying process, and also to prepare them for being put under the

stones when dry enough to be powdered. The drying is generally effected in a room heated to about 120°, by means of a stove or steam-pipe. The most common method of heating the drying-room appears to be by the use of a cockle, that is, a stove having an outer case or jacket, between which and the fire-case there is a space for the circulation of air. A great many different forms are given to the cockle, which is sometimes made of iron and sometimes of brick; but it should always be so placed that the fire can be fed from the outside of the room, so that the atmosphere of the room may not be contaminated with smoke or dust. The substances to be dried are spread out on trays, which are placed on open frames around the room.

The drying process being completed, the substance is placed on the platform of the mill, in the path of the stone runners, where it is ground until sufficiently comminuted for the commencement of the next operation, namely, that of sifting it. The two operations of grinding and sifting are then continued simultaneously, the operator transferring a portion of the powder from the mill to one of the drum sieves, which latter, with its contents, is put into its appropriate receptacle in the frame of the sifting apparatus, where it is subjected to the requisite succussion. The residue, which does not pass through the sieve, is returned to the mill, and a fresh portion of powder taken out to be sifted; and this mode of proceeding is continued without suspending the motion of any part of the machinery, until the process is nearly finished.

In using the stampers, it is necessary to suspend the pounding or stamping while the substance under operation is being removed from, and introduced into, the mortar, which somewhat retards the process.

The facility with which drugs are reduced to powder depends in great measure upon the extent to which they have been previously dried. If they be not deprived of their hygrometric water to the greatest extent practicable by ex-

posure in the drying-room, it will be difficult, if not impossible, to produce perfectly smooth and impalpable powders, such as are now generally used in medicine. This drying is, of course, accompanied by a diminution of weight, arising from the loss of water and other volatile constituents, which varies considerably in different drugs, and also in different specimens of the same kind of drug. There is always, however, a little moisture again absorbed during the process of grinding.

There are some drugs which, however carefully they may be dried, are, nevertheless, with great difficulty reduced to powder by the ordinary method of proceeding. Nux vomica, St. Ignatius's beans, and the tuberous root of the orchis, belong to this class. They are tough and horny, and can hardly be powdered without a particular treatment. The best method of preparing nux vomica and St. Ignatius's beans for pulverization is to expose the seeds to the action of steam until they have swelled to about twice their original size, and then to dry them rapidly in the drying room. The roots of the orchis, which are ground to make saloop-powder, should be macerated in cold water until they have become soft, and then dried, as in the other case. After being thus treated they are easily powdered.

Some substances cannot be powdered alone; they require the addition of other bodies which facilitate the disintegration. Thus the addition of a few drops of spirit renders the pulverization of camphor easy, although it could not be effected without it. Agaric is a substance which it is extremely difficult to powder alone, and a method has therefore been proposed for powdering it *by mediation.* It is cut into small pieces, wetted with mucilage of tragacanth, and then dried, previously to submitting it to the process of grinding. The addition of a foreign body, which the powder retains, cannot, however, be sanctioned, excepting under particular circumstances, such as the impossibility of otherwise effecting the object. It is stated in some phar-

maceutical works that colocynth is powdered by mediation, in the same way as that above described for the pulverization of agaric; but in this case the addition of a foreign body is certainly unnecessary, and I am informed that no such addition is made by the drug-grinders in this country.

The foregoing is a general outline of the various methods adopted in effecting the pulverization of drugs. We may now return to the question,—how far do these processes affect the composition, strength, and general medicinal efficacy of the substances operated upon?

The operations connected with the process of drug-grinding do not seem to be calculated to promote chemical change in the constituents of the powder; for, although the disintegration, by exposing a larger surface to the action of the air, may be somewhat unfavourable to the permanence of the proximate constituents of vegetable substances, yet the complete desiccation which forms part of the process will exercise a conservative influence to probably an equal extent. This, at least, would be the case if the powder, when prepared, be put in close bottles, and kept for only a moderate length of time.

The principal, if not the only necessary, cause of deterioration to the products, is the long-continued application of the degree of heat to which the drugs are exposed in the drying-room. There are some substances which cannot be thus dried without having a portion of their active volatile ingredients driven off, as well as the water they contained. The strong smell which fills the drying-room when opium, or myrrh, or cinnamon, are under operation, affords sufficient evidence that some volatile matter besides water is escaping, and that the resulting powders cannot strictly represent the drugs from which they are made. All substances which contain volatile principles must lose a portion of these during the drying process which precedes, and sometimes accompanies that of pulverization; and if the efficacy of the medi-

cine depend upon these volatile parts, the product must be injured by the process to which it is submitted. Thus myrrh, valerian, cardamoms, cinnamon, and spices generally, lose some of their efficacy in being reduced to fine powder.

But a large proportion of our drugs are not subject to deterioration from loss of volatile constituents; and in these cases, if care be exercised in conducting the process of drying, the powder obtained by the usual method of operating will possess all the medicinal properties of the crude materials. Rhubarb, jalap, ipecacuanha, colocynth, scammony, gamboge, and many other drugs, are not necessarily injured in the process of powdering.

There are some drugs which not only suffer no injury in being powdered, but which actually contain, when pulverized, a larger proportion of the active constituents than were present in the crude unpowdered substance. This arises from the circumstance that the less active parts are separated and rejected during the process. Thus, for instance, the powder of ipecacuanha, if properly prepared, contains more of the emetic principle than the root from which it is made. The principle upon which the emetic property of ipecacuanha depends, exists chiefly on the cortical part of the root, and as this is the most easily pulverizable, it passes first through the sieve, while the less active ligneous part, being more tough, remains to the last, and should be rejected as gruffs.

Besides the loss of water and other volatile constituents, which are driven off in the drying-room, there is also necessarily a dissipation and loss to certain extent of solid particles of powder, which are diffused through the atmosphere of the room in which the pulverization is conducted, or which adhere to the apparatus.

With these exceptions the product, including the gruffs or unsifted part, ought to be identical with the substance it represents; that is to say, should consist of the same particles, and no others, in the same chemical condition as they existed in previously to the process of powdering.

If no active constituents be lost in the drying process, the strength of the powder will be greater than that of the crude drug, to the extent of the quantity of water and inactive matter which have been separated and rejected. It would be very desirable to ascertain what the average increase of strength is in those drugs which suffer no deterioration in the process of powdering; and also what is the exact nature of the deterioration necessarily sustained by drugs, such as myrrh, ginger, cardamoms, and cascarilla, which contain, and must therefore lose active volatile constituents.

Next to the preservation of the medicinal efficacy of the drug, the most important object for attainment is uniformity of strength in the product. What security has the physician that a grain of opium or ten grains of jalap obtained from a particular source shall be equivalent to the same quantities of those substances obtained elsewhere.

There are several causes which tend to affect the uniformity of the strength of those medicines which consist of parts or crude products of plants. In the first place, these drugs, in their natural or original state are not uniform in composition and properties. Different specimens of cinchona bark yield very different proportions of the alkaloid upon which the efficacy of the drug depends—other drugs differ to an equal extent; in fact, what drug can be mentioned of which there are not good and bad specimens, in their natural state, to be met with in the market? The practical knowledge and experience of the druggist are called into requisition in selecting the good from the bad, and thus two classes, at least, are formed. There may be some approach to uniformity in each of these classes, but what uniformity is there between them? It must be admitted, however, that the criteria of excellence usually adopted in these cases are often founded upon qualities of an extrinsic character, which have no definite relation to medicinal properties.

Passing, then, from this source of disparity in quality and strength, and having selected the best specimens of the

crude drugs, what further causes are there which may affect the uniformity of their properties when in more advanced states of preparation?

Much has often been said on the subject of the adulteration of drugs, and especially of those drugs which are used in the state of powder. That drugs are sometimes adulterated is a notorious fact. That the practice of adulteration has prevailed to an extent greatly prejudicial to the advancement of the science of medicine, and discreditable to the medical legislation of the country, admits not of a doubt. But a great and progressive improvement has certainly taken place for many years past, and there is, at the present time, an evident desire among wholesale and retail druggists, to discourage and suppress the sale of bad and adulterated drugs.

We may pass over the statements, some of them greatly exaggerated, which have been published with reference to the wholesale substitution of fabricated powders for the drugs represented. Such statements relate to by-gone days, and they probably represent what were, even then, uncommon exceptions to the practice generally pursued. There is reason to believe, however, that absolute identity of composition between the powders used in medicine and the drugs they represent, is not always maintained to the greatest practicable extent, even in the present day. The art of drug-grinding has undergone considerable improvement within the last twenty or thirty years. Many of the powders now prepared are very different in appearance from those which formerly were used; and much more attention is now paid to colour and other external characters. But, is it not to be feared that the high estimation in which *good looking* powders are held, may cause the adoption of certain methods of dressing them, and artificially improving their appearance? There is reason to believe that a small quantity of turmeric or other colouring matter, is sometimes used for the purpose of brightening and improving the co-

lours of some powders, and that oil is also added in some cases, during the process of comminution, with a similar object. These additions are made in such small quantities, that they probably would not occasion any appreciable difference in the action of the medicines, but the fact that any such means are adopted establishes the necessity for some better criteria of quality than the mere appearances.

There is yet another source of disparity in the quality and strength of powdered drugs, which consists in a conventional practice of the trade with reference to the allowance made for loss of product during the process of grinding.

It has already been stated that the loss of weight which drugs undergo in grinding, is occasioned by the evaporation of water and other volatile constituents in the drying-room, and by the waste from dissipation in the form of dust, and from adhesion to the apparatus, in the grinding-room. It must be obvious that the amount of loss thus sustained will not be uniform; it will vary according to the nature of the substance under operation, and even with substances of the same nature, the loss will depend upon the quantity operated upon at a time, and their state of dryness when sent to the mill. Some drugs are frequently met with in commerce in a perfectly moist state, such as opium, aloes, scammony, and jalap. The loss of weight in drying these drugs, must of course be considerably greater than that which occurs with other less moist specimens, or with substances, such as rhubarb, ipecacuanha, or bark, which are never met with in a moist state. Now, there is in this variable condition of drugs as to dryness, a source from which disagreement might arise between the druggist and the drug-grinder, which probably led to the adoption of a practice in the trade of making a uniform allowance for loss of weight in grinding, whatever the nature or quality of the drug might be.

The rule adopted among the London drug-grinders, has been to have allowed to them four pounds on every hundred-

weight of the substance ground, for loss in the process. Thus, if a hundredweight of rhubarb were sent to the drug-mills, 108lbs. of powder including the gruffs, would be returned. It matters not what condition the rhubarb might be in, the drug-grinder would be expected to produce 108lbs. of powder from 112lbs. of raw material. The samé allowance would also be made, unless otherwise agreed between the parties, for all other drugs which required drying previously to their being powdered. In some cases the practice appears to have been to receive 116lbs. of the undried drug, and to return 112lbs. of dry powder. This is called the four per cent. system, four pounds being the allowance for loss upon every hundredweight of substance powdered. Some substances, however, such as cream of tartar and sulphuret of antimony, do not require to be dried before being powdered, and the allowance for loss on these substances is only two per cent.

This, which is commonly called the per centage, or four per cent. system, was at one time generally, if not uniformly, adopted by the drug-grinders of London, and although it has to a great extent been relinquished, having been wholly departed from by some houses, and partially by others, yet there are those who still contend that the specified allowance is a fair average of the loss necessarily occurring in the process of drug-grinding.

Being convinced of the injurious tendency of the four per cent. system, I applied to several parties engaged in the business of drug-grinding for information on the subject, and am indebted to one of these parties for a statement extracted from their books, showing the loss sustained in powdering drugs at their mills. Every drug powdered at the establishment alluded to, is weighed when received at the mill, and the ground products, consisting of fine powder and gruffs, are again weighed before being returned to the druggist. These weights are all entered in their books, a separate account being kept for each kind of drug, so that by taking an average of the results upon large quantities,

consisting of a great number of specimens received from different druggists, a near approach to a correct estimate is no doubt attained. The results nearly coincide with those observed by other drug-grinders from whom I have received information.

Name of Drug.	Total weight.	Greatest loss per cwt (112 lbs.)		Smallest loss per cwt (112 lbs.)		Average loss per cwt (112 lbs.)	
	lbs.	lbs.	oz.	lbs.	oz.	lbs.	oz.
Aloes, Barbadoes	379	9	12	0	7	5	12
" Hepatic	997	16	8	3	8	9	6
" Socotrine	882	12	0	4	0	9	4
Colnmba Root	733	12	0	1	12	6	6
Canella, alba	460	12	0	1	0	9	0
Cantharides	1006	3	0	—		1	8
Cardamoms	348	9	8	2	10	5	12
Cascarilla bark	794	8	14	2	0	6	0
Cinchona bark, pale	1547	7	8	4	0	6	6
" " yellow	1039	11	0	2	8	6	2
Colocynth	1034	11	8	3	8	6	8
Cubebs	1551	2	10	—		1	10
Dragon's blood	1004	13	0	1	4	5	12
Elecampane	1585	16	0	2	12	9	3
Fœnugreek	2593	13	0	2	0	7	10
Gamboge	1009	6	8	1	0	2	12
Gentian Root	5368	16	0	4	0	9	4
Ginger, Jamaica	8046	12	8	6	0	7	10
Gum Arabic	11,215	12	0	4	0	8	0
Ipecacuanha	2579	7	0	1	4	5	3
Jalap	9446	15	8	5	0	8	12
Liquorice	1255	12	0	—		6	3
Myrrh	2762	16	0	3	12	8	6
Opium	505	18	0	6	0	14	14
Orris root	3625	10	12	4	3	6	12
Rhatany	81	8	0	2	10	6	0
Rhubarb, English	1346	12	0	3	0	7	13
" Indian	5777	7	0	2	0	6	0
" Turkey	2018	8	4	3	0	5	12
Sarsaparilla, Jamaica	689	14	0	1	12	10	1
Scammony	1161	13	0	2	8	7	4
Seeds, Anise	2839	16	0	1	0	5	6
" Caraway	1569	13	8	2	8	8	12
" Coriander	1063	16	14	1	4	5	9
" Cummin	1142	12	0	1	4	5	4
Senna	606	11	8	3	8	6	6
Squill	974	15	0	8	0	12	8
Tormentilla root	231	12	8	2	0	6	12
Tragacanth	2077	13	12	6	12	8	4
Turmeric	5663	8	0	1	8	4	0
White Hellebore	5533	10	12	2	2	6	4
Valerian root	279	16	8	4	0	8	8

The first column of figures in the table represents the whole quantity of the specified drug which has been ground at several different periods; the second column indicates the greatest amount of loss on any one specimen; the third column indicates the smallest amount of loss on any one specimen, and the last column gives the average upon the whole.

It appears from this table that the average loss in powdering drugs is more than four per cent. in nearly all cases, and that in some it is considerably more. Now, it could not be reasonably supposed that the drug-grinder would in any case supply good rhubarb or jalap, gentian or ginger, for the water which had been imbibed in a damp warehouse or cellar. If he be required to make up a certain quantity of powder, evidently more than the crude drug produces, how is he to do it? Is he to keep a stock from which to supply the deficiencies of all the drugs he grinds, and go to market and purchase more when his stock is exhausted, or is there magical power in his mill?

A drug-grinder's mill is a very different thing from the pestle and mortar of the druggist, although they are both employed for the same purpose. The druggist, when he has used the pestle and mortar, cleans them preparatory for the next operation, by washing them with water. The drug-grinder also requires to clean his mill. Rhubarb must not be ground after aloes, nor ginger after jalap, without previously well cleaning the ponderous stones and other parts of the apparatus. But how shall this be done? A drug-mill cannot be cleaned by washing it with water—if for no other reason, it would be objectionable on account of its making the room and apparatus damp, which are required to be perfectly dry. Instead of water, sawdust is used for cleaning the drug mill. After grinding any drug, in order to remove the adhering particles from the mill, sawdust is ground until the mill is rendered sweet and clean.

Sawdust, then, is indispensable at a drug-mill, as necessary as water is in a druggist's shop, and if the druggist

sends damp jalap, containing fifteen per cent. of water, to be ground, and requires dry powder to be returned, with only four per cent. of deduction for loss, he adopts a conventional method of asking for some of the rinsing of the mill—a veritable "powder of post."

The four per cent. system cannot fail, wherever it is adopted, to induce a reduction in the strength of powdered drugs. If this reduction had tended to equalize the strength of different specimens, there might have been some excuse for it; but the effect of the system must obviously be to cause a reduction in an inverse ratio to the previous strength of the drugs, so that the weakest and worst drugs will be most diluted. But this objection which applies to the very principle of the system, is not the most serious objection to which it is subject. It sanctions the practice of admixture, and affords facilities for those who are disposed to pursue a ruinous competition in price at the sacrifice of quality.

There are two causes which, I believe, principally tend to frustrate the efforts of those who are endeavoring to put a stop to the adulteration of drugs, and to provide for the supply of medicines of the best quality; one is, the sale of cheap medicines by grocers and others not educated as Pharmaceutists, who are unable to distinguish the good from the bad, or indifferent as to which they sell; and the other is, the continuance, to whatever extent it may still prevail, of the four per cent. system in connexion with drug-grinding—a system which has no claim for support, save the old established usage of the trade. It should be the enlightened policy of an educated body of Pharmaceutists to afford a fair remuneration for honest industry; and this being secured, both druggist and drug-grinder would rejoice to be relieved from the trammels which have been heedlessly and most injuriously ingrafted upon the system of drug-grinding.—*Pharm. Journ.*

ART. VI.—ON AQUA-REGIA.

By M. Gay-Lussac.

Since the time of Berthollet, most chemists have considered aqua-regia, or the mixture of nitric and hydrochloric acids in variable proportions, as composed of free chlorine and nitrous gas, held in solution by the two acids, and more particularly by the nitric acid. Berthollet also showed that chlorine and nitrous gas combine at the moment of mixture, and are subject to a considerable condensation of volume. After 50 years of silence upon this point, Edmond Davy discovered that when nitric is allowed to act upon common salt, a gaseous mixture is evolved of an orange-yellow colour, which contains chlorine, and another gas easily absorbable by water. He likewise pointed out the similarity of this gaseous mixture to the condensible compound of chlorine and nitrous gas of Berthollet, and was led by his experiments to the conclusion that the gas was composed of equal volumes of chlorine and nitrous gas, united without condensation. Baudrimont here took up the investigation, and condensed into a reddish-brown liquid, by means of a freezing mixture, the gas evolved from aqua-regia. His analysis of the compound induced him to assign it the formula—

$$NO_3\,Cl_2.$$

and to substitute the name of chloronitric acid in the place of chloronitrous acid, given to it by Davy. This compound was considered by Baudrimont as the active principle of aqua-regia. Notwithstanding these experiments, the majority were still in the habit of viewing aqua-regia, with Berzelius, in the same light as it was viewed by Berthollet. The composition of M. Baudrimont's compound, and the

theory of its formation from the elements of aqua-regia, gave no explanation of the simultaneous production of chlorine, which was invariably observed by all who have studied this acid mixture.

M. Gay-Lussac has collected the gases evolved from aqua-regia at the temperature of boiling water; and, passing them through a cooling mixture, has succeeded in condensing a cloudy lemon-coloured liquid, very different in appearance from a mixture of nitrous vapour and chlorine, while chlorine gas passed off.

This liquid was completely decomposed by water, without the evolution of any gas, and the solution contained hydrochloric acid, but no free chlorine. The amount of chlorine in the original gas was ascertained by precipitating the aqueous solution with nitrate of silver, and the relation which it bore to the other compound of nitrogen and oxygen was that of 2 equivs. to 1 equiv.

An analysis of the gas by means of mercury, which absorbed the chlorine, led to the same result, and confirmed the identity of the nitrogen compound with nitric oxide. The composition of the liquid is, therefore, expressed by the formula—

$$NO_2\,Cl_2$$

and this perfectly explains the simultaneous evolution of chlorine; 3 equivs. of oxygen, separating from an equivalent of nitric acid, give rise to 3 equivs. of chlorine, 2 of which remain in combination with the nitric oxide, and produce the new liquid acid, or *hypochloronitric acid,* while the other is liberated.

Aqua-regia, however, prepared under different circumstances, affords liquid products, which are by no means of such constant composition. When the muriatic acid of the mixture is replaced by common salt only just covered with the ordinary nitric acid of commerce, 2 equivalents of chlorine to 1.30 equivs., and another case to 1.53 equivs. of nitric oxide were obtained from the vapour of the liquid.

When gold is acted upon by aqua-regia, the nitric oxide in the mixture is reduced to somewhat less than 1 equivalent. These facts, and the different relative proportions of the two gases obtained from successive portions of the liquid, show that the body is a mixture, and that $NO_2 Cl_2$ is not the only constituent of the chloronitric liquid. There is at least one liquid in the condensed products from aqua-regia possessing the composition shown by the formula—

$$NO_2 Cl,$$

which latter may also be obtained directly by allowing nitric oxide and chlorine to condense together in a vessel surrounded by a cooling-mixture; but even then the product is not a definite body, for the proportions of nitric oxide gas in the less volatile portions are very much greater than in the more volatile. The same results were obtained from the vapour of the liquid condensed from a mixture of common salt with nitric acid.

These condensed liquids, prepared in different manners, are, therefore, mixtures in variable proportions of the two compounds, $NO_2 Cl_2$, and $NO_2 Cl$.

The products bear a great analogy to the hyponitric and nitrous acids, and it is proposed to call them *hypochloronitric acid* and *chloronitrous acid* respectively. They are both decomposed immediately by water, and give rise to hydrochloric acid and the products of hyponitric acid.

Aqua-regia, therefore, whether concentrated or diluted, without the agency of any other body, and simply under the influence of heat, is decomposed into chloronitric vapour, chlorine and water.

When gold is acted upon by aqua-regia, the author's experiments tend to show that the products of decomposition are precisely the same, the chlorine only being retained by the gold, and the chloronitric vapour, to which the action of aqua-regia upon gold has been erroneously attributed, passing off as if no gold were concerned in the reaction.—*Quarterly Journal of the Chemical Society.*

ART. VII.—ON THE CULTIVATION OF SAFFRON IN FRANCE AND AUSTRIA.

1. SAFFRON was not cultivated in France before the Crusades. The bulbs (*cormi*) from Avignon were introduced towards the latter end of the fourteenth century, by a gentleman of the family of Porchaires, who first planted them on his estate at Boyner. The botanical characters of the *Crocus sativus autumnalis* are well known. The same bulb, or cormus, flowers once only; and as soon as the flower is withered, a bud (*caïeu*) appears, which, after having produced several flowers in the autumn of the second year, also dies. After the third year the bulbs should be transplanted.

A dark, somewhat loose, sandy soil, in a sunny situation, suits it best. Heavy, wet, clayey, and freshly-manured soils are unfavourable for its cultivation. The usual manure is the marc of the grape. The bulbs are planted at the beginning of July, about twelve to a square foot. A temperature of 14° Fahr. is very injurious to them, in case the snow does not lie very high. In the Gatanais, the saffron herb dries up in May, but it is collected for feeding cows.

The saffron bulbs are subject to two diseases; one called the *tracon*, is a kind of dry rot (*carie sèche*,) the other termed the *death* (*la mort*) is chiefly humidity of the glandular bodies. Some agriculturists have cured the *tracon* by placing the bulbs for some days in well dried marc of grapes. The death (*la mort*) is incurable and infectious. Two different kinds of insects are found on the bulbs affected by this malady.

When the flowers are gathered, the stigmata (*le jaune*) are plucked off, dried and preserved in dry wooden boxes, for when well protected from dampness, the saffron keeps for years.

Saffron is adulterated by mixing it with safflower, marigolds reddened by salt, and shreds of beef (*la rouelle de bœuf.)*

Saffron is employed in dyeing, in cookery, in pharmacy, and in medicine.

In France and Spain, a balsam or saffron ointment is prepared from it, under the name of *Croco-magna* or *Crocium.* It is also used as a prophylactic against sea-sickness.

2. The saffron of Lower Austria is the best and most costly in Europe, but the produce is scarcely sufficient for the home consumption,[6] and therefore saffron is imported. It is chiefly produced at Ravelsbach, Meissau, Eggendorf, Kirchbeg, and Wagram. Most of the saffron gardens have a substratum of loam, covered about a foot high with mould. Wheat fields are best adapted to the cultivation of saffron, the produce being three-fold that of the wheat. The gardens should be placed dry, exposed to the sun, and towards the south, and protected against northerly winds. They should not be shaded by forest trees, nor be too much elevated and exposed to the wind. Districts favourable for the cultivation of the vine suit best.

The flowering season begins during the last week of September, and ends in the first week of October; but it sometimes lasts till the beginning of November.

The soil is prepared after three methods; the first is similar to that of preparing a garden-bed.

By the second method, the field is ploughed in autumn after the harvest, the same as for wheat, only somewhat deeper and narrower.

According to the third method, the field is ploughed immediately after the harvest (whether of wheat, rye, or oats) and then rolled and harrowed. Three days before planting the field is trimmed. The manure is only added during planting, but so that it is well covered with earth and does not come in contact with the bulbs. This method requires

the best soil and the smallest and best manure, as sheep manure.

The saffron bulb is called in Austria *Kiel.* It is of the size of a walnut, surrounded by ten or twelve soft, brass like membranes, of a cinnamon-brown colour, which terminate at the top, around the germ, in capillary threads—called *Bollen*—but in such a manner that only about three of them reach the top, the others being shorter and finer. The mul tiplication of the saffron proceeds from these bulbs (*Kiele.*) No case is known of a flower producing seed. Each bulb produces within half a year, namely, between autumn and the end of spring, from one or two, or from three to four new young bulbs; but the parent bulb perishes in the mean-while every year, and nothing remains of it but some coarse blackish brown membranes, called *Bollen,* and a dried hard mass—the *Plattel,* on which the young bulbs are seated. Before the bulbs are planted, they must be cleared of all membranes remaining of the parent bulb, of the plattel, &c., and all damaged or diseased bulbs rejected. They are stowed away three to four inches high, in a dry airy place.

The sowing is performed by two men, one making with a hoe furrows of eight inches depth, the other placing the bulbs three inches apart, and pressing them in the ground so that they are half covered.

The saffron flowers appear before the leaves, and can easily be removed, without disturbing the bulb. The best time for gathering them is early in the morning, while they are closed. When gathered, they are spread in a cool room, on cloth or straw mats, until fit for picking. The picking (called *Saffronlösen*) consists in separating the trifid stigma from the style, and removing it from the flower. This is done the day after the gathering, and must be performed without separating the parts of the trifid stigma (called the *Zunglein*, or little tongue) from one another. They should remain adherent, or, as it is said, "the *Bock*

should be entire." Little or nothing of the yellow style should be left attached to the stigma. In this way the saffron has a better appearance and fetches a higher price. On the following day it is dried on a hair seive over a charcoal fire; and placed in boxes without compression. After a few hours it becomes oily and flexible, and can then be pressed into well-closed boxes.

Most of the Austrian saffron is sold at Krems on the 28th of October. Its price is from 30 to 32 fl. [=36—38 fl. 24 kr. Rhenish] per pound.

After the crop of the first year, the green leaves are left growing till the spring of the next year, and in June, when they begin to wither and to become yellow at the top, they are mowed as food for cattle. The little bulb (*Knöllchen*) which in the first year had formed itself on the parent bulb, and from which a little tube, with or without flower, had already grown, in the autumn of the second year, goes on swelling till the spring. About Whitsuntide, the new bulb (*Kiel*) called *Kindel*, is perfect. If every thing goes on well, the saffron-garden will, in the autumn of the second year, contain two or three times the quantity of bulbs (each bearing two or three flowers) originally planted. If the bulbs are left for a third crop, nothing else is to be done but what was required after the first, namely, mowing the grass and carefully removing the weeds in July. It is, however, remarkable, that neither bulbs nor flowers multiply in the third year.

The bulbs having now yielded saffron for two, three, or four years, are removed about Whitsuntide, when the new bulb (*Kiel*) is fully developed, the saffron-grass gathered, and the old bulb quite disappeared. By means of a coarse seive they are cleaned of the adhering mould, and stored up in an airy barn or loft.

Three diseases are known to attack the bulbs. The first is the rot (*Faulniss*,) which, though visible externally, de-

stroys the substance of the bulb. The second disease is a turnip-like excrescence (*Rhizoctonia crocorum*, Decand.) which appears mostly on the inferior part of the bulb, which it deprives of its nourishment. Both this, as well as the beforementioned disease, is not common. The latter can be removed by picking the bulbs.

The third is the most fatal malady. It is called the *death* (*Tod.*) It consists in the formation of a malignant, woolly, truffle-like fungus, composed of several separate balls of the size of a hazel-nut. These are partly close to the bulb, partly one to three inches distant from it; but they never appear at the surface of the ground. From these balls, a large number of violet-coloured, fine, woolly fibres spread, partly from one ball to the other, partly surrounding the membrane of the bulb like a net. They penetrate between the membranes to the substance of the bulb, and then kill it. In Lower Austria the disease is called the *Brand, or Austand.* One such diseased bulb is sufficient to infect a whole garden. The existence of the disease is known by bare circular spots in the saffron-garden; in the bulb itself black holes are perceived, as if dusted with soot; sometimes they look as if burnt. Duhamel advises the spread of the disease to be checked by digging one foot deep around each infected spot, and placing in heaps the earth of the infected spots. —*Pharm. Journ.*

ART. VIII.—PREPARATION OF COLLODION, OR SOLUTION OF GUN-COTTON, AS AN ADHESIVE MATERIAL FOR SURGICAL PURPOSES.

M. MALGAIGNE has recently communicated to the French Medical Journals some remarks on the preparation of gun-cotton for surgical purposes. Several French chemists, at the suggestion of M. Malgaigne, attempted to make an ethereal solution of this compound by pursuing the process recommended by Mr. Maynard in the "American Journal of Medical Sciences," but they failed in procuring the cotton in a state in which it could be dissolved by ether. It appears that these experiments had employed a mixture of nitric and sulphuric acids; but Mr. Mialhe ascertained, after many trials, that the collodion, in a state fitted for solution, was much more easily procured by using a mixture of nitrate of potash and sulphuric acid.

For the information of our readers who may be disposed to try this new adhesive material, we here give a description of M. Mialhe's process for its preparation. It appears, from the results obtained by this chemist, that cotton, in its most explosive form, is not the best fitted for making the ethereal solution:—

Finely powdered nitrate of potash . .	40	parts by	weight.
Concentrated sulphuric acid *	60	"	"
Carded cotton	2	"	"

Mix the nitre with the sulphuric acid in a porcelain vessel, then add the cotton, and agitate the mass for three minutes by the aid of two glass rods. Wash the cotton, without first pressing it, in a large quantity of water, and when all acidity is removed (indicated by litmus-paper), press it firmly

* The common commercial acid will answer. When very weak, a longer immersion of the cotton is required.

in a cloth. Pull it out into a loose mass, and dry it in a stove at a moderate heat.

The compound thus obtained is not pure fulminating cotton; it always retains a small quantity of sulphuric acid, is less inflammable than gun-cotton, and it leaves a carbonaceous residue after explosion. It has, however, in a remarkable degree, the property of solubility in ether, especially when mixed with a little alcohol; and it forms therewith a very adhesive solution, to which the name of *Collodion* has been applied:

Preparation of Collodion.

Prepared cotton - - - -	8	parts by	weight.
Rectified sulphuric ether - -	125	"	"
Rectified alcohol - - - -	8	"	"

Put the cotton with the ether into a well-stopped bottle, and shake the mixture for some minutes. Then add the alcohol by degrees, and continue to shake until the whole of the liquid acquires a syrupy consistency. It may then be passed through a cloth, the residue strongly pressed, and the liquid kept in a well-secured bottle.

Collodion thus prepared possesses remarkably adhesive properties. A piece of linen or cotton cloth covered with it, and made to adhere by evaporation to the palm of the hand, will support, after a few minutes, without giving way, a weight of from 20 to 30 lbs. Its adhesive power is so great that the cloth will commonly be torn before it gives way. The collodion cannot be regarded as a perfect solution of cotton. It contains, suspended and floating in it, a quantity of the vegetable fibre which has escaped the solvent action of the ether. The liquid portion may be separated from these fibres by a filter, but it is doubtful whether this is an advantage. In the evaporation of the liquid, these undissolved fibres, by felting with each other, appear to give a greater degree of tenacity and resistance to the dried mass.

In the preparation of collodion it is indispensable to avoid the presence of *water*, as this renders it less adhesive; hence the ether as well as the alcohol should be pure and rectified. The parts to which the collodion is applied should be first thoroughly *dried*, and no water allowed to come in contact with them until all the ether is evaporated.—*London Medical Gazette.*

ART. IX.—THE CINNABAR MINES OF UPPER CALIFORNIA.

By the Rev. C. S. Lyman.

The mine of New Almaden is situated a few miles from the coast about midway between San Francisco and Monterey, and in one of the ridges of Sierra Azul mountain. The mouth of the mine is a few yards down from the summit of the highest hill that has yet been found to contain quicksilver, and is about 1200 feet above the neighbouring plain, and not much more above the ocean. This hill extends longitudinally in a north westerly direction, decreasing in height; and in various parts of it, for several miles, traces of the ore have been found, and some openings have been made which promise to be valuable. This range of hills consists of a variety of rocks, which I have not yet had an opportunity properly to study. The prevailing one is a greenish talcose rock, which seems to embrace the bed of ore at the New Almaden mine both above and below. A specimen from the rock immediately contiguous to the ore is contained in the box. The ore is interspersed through a yellow ochreous matrix, which forms a bed 42 feet in thickness, dipping northwesterly at an angle of about 45°. The richest ore is at present found in the upper part of the bed, the poorer ores being taken from the lower portion.

This mine, known to the aborigines from time immemo-

rial as a "cave of red earth," from which they obtained paint for their bodies, was first discovered to contain quicksilver about four years since, during experiments made by some Mexicans to smelt the ore for the purpose of obtaining *gold*, which they supposed it to contain. About two years ago it fell into the hands of Barron, Forbes & Co., who sent on hands, tools and funds to commence working it. Unfortunately the vessel fell into the hands of the United States forces, and was confiscated; the operations of the mine were of course delayed till the arrival of Mr. Forbes himself a few months since, with miners, tools, and whatever things he was able to procure in Mexico, to enable him to make a fair experiment on the capabilities of the mine. The great trouble was to obtain suitable apparatus for extracting the ore. At length four potash kettles were found, which were set in a furnace of adobies, with condensers of mason-work immediately adjacent—a wretched apparatus indeed for managing so subtle a thing as mercurial vapour. While I was at the mine the daily mode of working was to fill these pots in the morning with 1600 lbs. (400 to each pot) of the ores of average quality, broken in lumps of the size of apples, put on the covers and *lute* them with a layer of *sand*. The fires were then kept up till near night, when the furnaces were allowed to cool gradually. The next morning the condensers were opened, and the metal dipped up; which usually amounted to from 200 to 300lbs. for the four pots. This was a much less per-centage than the assay indicated, and it was obvious that a large portion of metal was lost. The upper parts of the pots and condensers were found to be generally coated with a crust of sulphuret of mercury, of which No. 15 is a small specimen. Mr. Forbes wished to devise some way of extracting the metal without mixing lime with the ore in the roasting, but was unsuccessful. At length a kiln of lime, which occurs in the immediate vicinity, was burned; and I am informed that, mingled

with this, the ores yield a vastly larger per-centage of metal. In the last three weeks about 10,000 lbs. of metal have been extracted with the same apparatus, being a yield of over 50 per cent. Whether the ores were picked or not I cannot say, but presume they were. Between 15,000 and 20,000 lbs. have been extracted in about two months, only six miners have been employed in digging the ore, and the hands of the establishment, all told, miners, furnace-men, wood-choppers, &c. &c., numbering only a score. The mine is probably yielding a net profit of 100,000 dollars a year with its present crude apparatus. With suitable furnaces and iron cylinders or retorts, the mine would easily yield 1,000,000 dollars and upwards. Mr. Forbes sails to Europe shortly for the apparatus necessary. The bed has as yet been followed but a few hundred feet, but the ores grow more and more rich and abundant.

The other mines opened in the vicinity have not yet been sufficiently developed to decide upon their character. Ore has been found in fifteen or twenty other places within a few miles around and within a few days in hills that do not seem to belong to the same range with that which contains the mine already described.

Some ores of silver have also been recently discovered in this region; but I have had no opportunity of procuring any genuine specimens as yet, and whether silver mines worth the working will be found is at least problematical.

There are traces of coal in the country, but nothing of value has yet been discovered.

Gold has been found recently on the Sacramento, near Sutter's Fort. It occurs in small massses in the sands of a new mill-race, and is said to promise well.—Silliman's *Journal*, September, 1848.

ART. X.—ON NAPTHA AND ITS USES.

By ANDREW URE, M. D., F. R. S.

IN the last number of this Journal, a notice was inserted about the curative virtue of mineral naptha in Asiatic cholera, as verified by Dr. Andreosky, physician to the commander-in-chief of the Russian army in Circassia. The naptha there employed has been long known as the produce of springs on the north-west coast of the Caspian Sea, not far from the town of Derbend, near the Gulf of Baku, which was incorrectly printed Beker. It is surprising that in the instructions of the Petersburg police board just published, as to the proper precautions and best remedies against cholera, now beninning its ravages in that capital, no allusion whatever is made to naptha, or to Dr. Andreosky's testimony in its favour. Are we hence to infer that the preceding recommendation of that substance is apocryphal, or that it has since lost all credit with the Russian faculty, by whom the police bulletin was prepared?

The soil near Derbent, from which the naptha oozes into wells about thirty inches deep, is a clay marl, which is thoroughly soaked with that fluid. It has a pale yellow colour, like that of Amiano near Parma, in Italy, but has a specific gravity of 0.853, while that of Amiano is only 0.836. Their boiling point is about 305° Fahr. Submitted to distillation, it affords a colourless fluid of spec. grav. 0.728, which boils at about 176° Fahr., but has acquired an empyreumatic odour, very different from that of the native product. Barbadoes tar of the best kind differs from these naphthas only in containing a little more bitumen, but it is equally fragrant. When distilled it yields a similar lighter naphtha, but likewise empyreumatic. The native sub-

stances are composed of 6 atoms of carbon and 6 atoms of hydrogen; or in 100 parts, of 86 and 14, by Hess's analysis.

Mineral petroleum seems to be very different in constitution and qualities from the fetid, factitious tar, derived from the igneous decomposition of pit-coal. The latter, according to Mr. Mansfield, is resolvable into six different substances, which he names *alliole, benzole, toluole, camphole, mortuole,* and *nitrobenzole.* I do not believe that a series of similar bodies can be extracted from native bitumen or petroleum. Indeed, he himself informed me that the fluid bitumen now being pumped up so abundantly from the Redding coal mines in Derbyshire, of which I furnished him with a specimen, affords no such distinction of products, a result in accordance with my own experience. These differences between the natural and factitious petroleums lead me to conclude that the former are not the result of igneous action, but of that of water upon carbonaceous matter in the mineral strata. In confirmation of which view it may be observed that not only in the above-named localities, but also at Monte Ciaro near Piacenza, at the Lake of Tegern in Bavaria, near Neufchatel in Switzerland, in the Department of the Ain in France, &c., the bitumen is accompanied with a copious flow of water, on which it floats, and from which it is skimmed.

Petroleum of various shades, from the green of the Barbadoes springs to the pale yellow of Amiano, has been long known to possess certain medicinal properties. The rock-oil of Barbadoes, or as it has been vulgarly but improperly called, Barbadoes-tar, has been found an useful stimulant to torpid bowels, promoting in such a temperament the alvine discharge. Its chief value, however, is as an external remedy in a variety of cutaneous affections. But petroleum, either by itself, or combined with any of its solvent

essential oils or spirits, would in general act rather as an irritant and rubefacient upon the skin in such cases, than as a purifying, cleansing, and soothing application. In this dilemma, the idea occurred of incorporating the green rock-oil with fine curd soap. Thus a truly balsamic compound has been obtained. When the soap, used with water in the usual way, has cleared out the cutaneous pores, a film of the petroleum is deposited in them, powerfully remedial in many of the morbid affections of the skin. Such petrolized soap has been found to be quite a specific in the prickly heat of tropical regions, and of equal efficacy in the fiery eruptions incident to many persons in temperate climates. Hitherto, no method had been devised for mollifying efficaciously the alkalinity of soap, which being, as in the best white curd article, a definite saline compound of stearic acid, and soda in its most caustic condition to the extent of six per cent., cannot fail to excoriate delicate skins. By the present happy invention, each particle of that salt is enveloped with a film of balsam, which mitigates its irritant, without interfering with its detergent quality. Hence we may account for the preference given to the petroline soap by all who habitually use it at the toilet-table.—*Pharm. Journ.*

ART. XI.—ON QUINOIDINE.

By F. Roder.

The author has, in consequence of the results published by Liebig on the constitution of quinoidine, made some experiments to obtain from quinoidine or amorphous quinine the latter in a crystalline state. 1 part of commercial quinoidine is dissolved in 4 parts alcohol of 0·865, and a solution of ½ a part protochloride of tin in 2 parts of water added to it.

This precipitates a dark resinous mass, while the supernatant liquid is but faintly coloured; it is separated from the precipitate, and quickly precipitated with ammonia. The precipitate is then well washed and dried, and exhausted with alcohol as long as this removes anything; the united extracts are again mixed with half the former amount of protochloride of tin, again quickly precipitated with ammonia, and the well-washed and dried precipitate exhausted with alcohol, when an almost colourless solution of pure quinine is obtained, which, carefully saturated with dilute sulphuric acid, affords on evaporation crystals of sulphate of quinine.

In the liquid filtered from the precipitate of protoxide of tin and quinine, as well as in the wash-water, cinchonine is contained, if ordinary quinoidine has been employed which has not been previously purified by precipitation with an alkali. These liquids, containing cinchonine, are precipitated with tincture of galls to obtain the cinchonine in the usual manner.

The precipitated resinous substance still retains some quinine, to obtain which it is dissolved in alcohol, again mixed with a strong solution of protochloride of tin, and then further treated in the above-mentioned manner. The resinous substance so obtained is of an alkaline nature, of a bitter taste, and possesses the peculiar odour of quinoidine; it would probably yield more quinine on further treatment.

The author obtained by this process from two different samples of quinoidine, in one case 43 per cent. quinine, 9 per cent. cinchonine, and 28 per cent. resin; and in the second 40 per cent. quinine, 10 per cent. cinchonine, and 30 per cent. resin; the water amounted to 20 per cent. On precipitating 100 parts of commercial quinoidine in solution with an alkali, the precipitate obtained weighed 69 grs.—*Chem Gaz. from Mittheilungen des Schweizer.*

ART. XII.—ON THE INFLUENCE OF TIME UPON THE FORMATION OF CHEMICAL BODIES.

By Prof. J. Liebig.

When effloresced oxalic acid is mixed with an equal weight of alcohol, this liquid takes up a certain quantity of it, far more at a high than at the ordinary temperature. When the alcohol is saturated hot with it, a portion of the oxalic acid again separates on the cooling of the liquid. These facts are so well known, that they would scarcely deserve special mention, did not this solution gradually lose the above properties. In fact, when a boiling saturated solution of oxalic acid in alcohol, which consequently on cooling deposits a large amount of crystals, is kept for some time at a temperature of 104° to 122°, the quantity of the crystals deposited on cooling decreases after some days, and in the course of several months this liquid no longer affords any crystals. Long before this time a considerable amount of oxalovinic acid and oxalic ether may be detected in the solution; and at last so much of the latter, that on the addition of water it separates in the usual heavy oily drops. On saturating the liquid with chalk, a quantity of lime remains in solution as oxalovinate; on mixing it with ammonia, a considerable quantity of oxamide is obtained. Hippuric acid behaves in exactly the same manner. From a hot saturated alcoholic solution this acid crystallizes in the well-known long needles; but if the solution be kept for several weeks in a warm place, the form of the deposited crystals varies perceptibly, the needles become shorter and shorter, and the acid subsequently separates in cauliflower-like masses, without any distinct form. At last crystals are formed, which melt like an oil at a gentle heat, and possess all the properties of hippuric ether.

It is not every acid, however, that is converted into an ether by contact with alcohol under similar circumstances; benzoic acid may be kept for weeks in a warm spot with alcohol, without the crystals which separate on cooling being altered in form or size; but if a hot saturated alcoholic solution of this acid, which on cooling would solidify to a solid paste, is mixed with a few drops of fuming hydrochloric acid, or, which is preferable, with some alcohol which has been saturated with hydrochloric gas, and the mixture kept at a gentle heat from eight to fourteen days, it entirely loses the property of depositing crystals on cooling. The greater portion of the benzoic acid is converted into benzoic ether, which, on the addition of water and carbonate of soda to remove the hydrochloric and free benzoic acids, separates on the application of a gentle heat in transparent oily drops, which collect at the bottom on cooling. This behaviour of the hydrochloric acid appears to me deserving of consideration, as the action of the very minute quantity present appears to resemble that of the deutoxide of nitrogen in the formation of sulphuric acid. It is known that the chloride of benzoyle mixed with alcohol is instantly metamorphosed into hydrochloric acid and benzoic ether; and it is not impossible that the hitherto enigmatic part which this hydracid takes in the formation of several ethers, depends on the production of chlorine compounds, by the decomposition of which with alcohol the hydrochloric acid is constantly set free again, so that a minute quantity suffices to convert an unlimited amount of acid in ether. I do not, however, mean to deny that this reaction admits of other modes of explanation.

The formation of acetic ether and of enanthic ether in wines on keeping, appears to take place in a very similar manner. It is well known that wines possessing a considerable bouquet, when submitted to distillation, yield a residue of a very disagreeable taste and a distillate con-

taining much alcohol; and that, on mixing the two, a liquid is obtained which has not the least resemblance in taste to the original wine. Geiger observed, that when the distillate mixed with the residue was kept for several years in a cool spot, the original wine was reproduced with scarcely any perceptible difference in taste and odour. It appears, according to this, that what is termed the "bouquet" of wine is owing to the formation of ether compounds; and we may expect that, by a careful examination, their nature will be ascertained; it is not at all doubtful that they can be prepared artificially.—*Ibid, from Liebig's Annalen.*

ART. XIII.—ON THE MANUFACTURE OF SUGAR IN BARBADOES.

By George Fownes, F. R. S.

Professor of Practical Chemistry in University College, London.

The processes of the sugar manufacture of Barbadoes appear to have undergone but little alteration for many years past, and are nearly the same as those employed at a very early period in the history of the colony. A few of the more intelligent and enterprising planters have lately attempted the introduction of improvements with a zeal which does them honor, but from circumstances easily understood the management of the great majority of estates is still the same as in the days of slavery.

The common process of sugar-making is too well known to need a lengthened description. The canes are crushed by a machine consisting of three vertical iron rollers, put in motion by a wind-mill, and the juice, after passing through a strainer, is received into the clarifying vessels, usually of the capacity of 300 or 400 gallons, where it receives the usual dose of lime or "temper," and a sufficient

degree of heat to occasion the separation of an abundant *coagulum* of insoluble matter, part of which rises to the top in the form of scum, while the remainder subsides as a thick muddy deposit to the bottom of the vessel. The clear liquor is drawn off by a cock into one of the larger evaporating pans, and rapidly boiled down until its bulk is considerably reduced. From thence it is transferred to a smaller pan, and still further concentrated. The scum which constantly arises during the boiling, is removed by skimming, and reserved, together with the feculencies, separated in the clarifying vessel, for the manufacture of rum; it forms in fact, the ferment to the saccharine liquid, and replaces the yeast employed by the distillers of Europe. The concentration of the cane-juice is completed in the smallest of the series of pans, whence it is emptied or "skipped" by an ingenious contrivance, first into a copper cooler, and afterwards into a large shallow wooden crystallizing vessel, and stirred from time to time. In a few hours, the dark pasty mass of crystallized sugar and fluid molasses is found sufficiently firm for "potting" or "curing;" it is put into hogsheads perforated with a few holes, and there allowed to drain for a period of time varying from two or three days to a fortnight, the molasses being received into an open cistern beneath, covered with a strong framing of joists, upon which the hogsheads rest. The sugar is lastly "headed up" for shipment, and sent into commerce.

In the arrangement of the boiling-house plan, the evaporating and clarifying vessels are ranged in a row, and heated by a single fire, which is made immediately under the last and the smallest, the series of four or five terminating with the clarifier; they are usually made of copper, and surmounted with leaded slopes to retain the boiling and frothing liquor, which is transferred from one to the other, partly by means of a sluice in the slope, and partly by baling. The fuel is the "megass" or crushed cane of the preceding year, dried in the sun, and carefully preserved in

a shed or in stacks; it burns rapidly, producing a powerful flame, which maintains the whole of the evaporating pans in a state of rapid and violent ebullition, besides imparting the requisite degree of heat to the liquor under clarification.

The juice, as it flows from the crushing-mill, is frothy, turbid, and foul, but very pale in colour; after clarification carefully conducted, it becomes quite clear, but acquires the light amber colour of pale sherry or Madeira wine. In the evaporating vessels it becomes darker and darker, until when removed from the last and smallest pan to the cooler, it nearly resembles in colour and consistence ordinary tar. After crystallization, however, the greater part of the dark colouring matter drains away in the mother-liquor or molasses, leaving the crystals in the yellowish or brownish state familiar to every one in common raw sugar. Even this degree of colour, however, is in great part superficial, for if the crystals be washed with a little water or white syrup, they become nearly white.

In the process of tempering, considerable judgment is required; enough lime in the state of lime-water, or milk of lime, should be added to render the liquid quite neutral, or perhaps better, with a very slight tendency to alkalinity. An excess of lime does great mischief, darkening still further the liquor, and injuring the product of crystallized sugar both in quality and quantity. From the variable nature of the cane-juice, according to the season, wet, and other circumstances, the quantity of lime required is found to vary greatly.

The skill and judgment of the sugar-boilers are again exercised in deciding on the most advantageous degree of concentration to which to bring the syrup in the last pan. If it be not pushed far enough, the product of sugar is greatly diminished; if, on the contrary, it be left for even a very few minutes too long over so fierce a fire, it is so far altered in properties as to be in great part rendered uncrystallizable. In both this and the clarification process, the

usual, perhaps only, guide, is experience acquired by practice.

Such is the plan of operations yet almost universally followed, with occasional slight and inconsiderable variations, not only in Barbadoes, but in most of the West India Colonies. The greatest variations are in the crushing-mill; the power of the wind is used in Barbadoes, where it commonly blows with great strength and regularity during the three or four spring months of crop time. In the mountainous islands water-power is had recourse to, and where neither of these is available, steam-power is used; coal being imported from England for the purpose of heating the boilers, and the megass reserved for the evaporation of the juice.

Before pointing out the defects of the present system of manufacture, it will be necessary to say a few words concerning the chemical composition of cane-juice, as far as it is known. Our information on this important subject is yet defective; it may be hoped, however, that the researches which Dr. Shier, aided by the wise liberality of the government of British Guiana, has been enabled to make, added to those of other inquirers in the same field, may shortly throw considerable light on this great fundamental point.

Fresh cane-juice, from mature and healthy canes, possesses a very pale yellowish grey colour, a faint, fragrant odour, and a powerfully sweet and somewhat fruity taste, to most persons very agreeable. It is somewhat thick and clammy, having a sp. gr. ranging from 1.070 to 1.090, and in some cases higher. It is turbid or opalescent from finely-divided suspended matter, and filters through paper with great difficulty and little increase of transparency. This turbidity is commonly a little increased by boiling, and sometimes a few small flock separated. The juice is very faintly, though decidedly acid to delicate litmus paper, which re-action is not altered by boiling. It is unaffected by acids, with the

exception of nitric acid, which occasions after a time a very slight precipitate. Corrosive sublimate gives a similar result. The ordinary tests discover the presence of salts of lime and magnesia, sulphuric and phosphoric acids, potash and soda, in variable quantities. A large addition of alcohol throws down flocks of a substance resembling gum or dextrine, and, lastly, a few drops of sulphate of copper, and an excess of caustic potash occasion on heating a very abundant red precipitate of suboxide of copper, the well known mark of the presence of glucose or grape sugar.

When lime-water is added in slight excess to cane-juice a copious precipitate falls, which consists of an azotized organic substance in combination with lime, waxy or fatty matter, and the phosphates of lime and magnesia, the latter constituting more than a fourth part of the dried mass. A similar precipitate is caused by potash and ammonia. The juice therefore appears to contain the following substances, cane-sugar in great quantity ; a notable amount of glucose, or sugar of fruits ; gum or dextrine ; phosphates of lime and magnesia retained in solution ; some other salt of lime and magnesia ; sulphates and chlorides ; potash and soda ; and, lastly, a peculiar azotized matter belonging to the albuminous family hitherto undescribed, capable of forming an insoluble compound with lime, not coagulable by heat or acids, and readily putrefiable. Of ordinary vegetable albumen there are but indistinct traces, and of caseine or legumine none.

Cane-juice, left to itself a few hours at the ordinary temperature of tropical countries (80° or thereabouts,) becomes very turbid, begins to disengage gas, and deposits a copious flocculent precipitate. In this state it is acid to test paper, and offensive to the smell. The boiled juice keeps better, and that which has undergone the lime-defecation may be kept unchanged for twenty or twenty-four hours, after which period it also becomes turbid and spoils.

When lime-water is added to fresh and heated juice until reddened litmus paper shows the slightest possible trace of alkalinity, the whole heated to the boiling-point, and after standing a few minutes placed upon a paper or cloth filter, a perfectly clear, pale, yellow liquid runs through, leaving on the filter a greenish-grey mass, having the composition already mentioned—namely, consisting chiefly of azotized organic matter combined with lime, and the phosphates of lime and magnesia. The filtration is particularly rapid and easy. The clear liquid evaporated to a syrupy state over the open fire throws up no scum whatever, and colours but little in this condition, exposed to spontaneous evaporation in a shallow vessel, it furnishes a mass of crystallized sugar sometimes perfectly dry, and sometimes accompanied by more or less yellow uncrystallizable syrup, in which the presenceof common salt in large quantity can be recognized, this body having, as is well known, the power of forming with cane-sugar, a highly soluble and deliquescent compound. Even when the whole crystallizes, however, and and very little common salt can be detected, the resulting sugar absorbs water when exposed to a very damp atmosphere, and becomes moist or wet, indicating the presence of some deliquescent material in the juice.

The statement, therefore, that good cane-juice contains no saccharine matter but crystallizable sugar, and that the production of molasses or uncrystallizable syrup is wholly due to the excessive heat employed in the common process, must be received with some reservation. No doubt crystallizable sugar to a great extent is destroyed in the boiling, and especially in the last pan, where the boiling point of the liquid rises 235° or 240°, or even higher, and that the result of such mismanagement is a very gréat increase in the proportion of uncrystallizable mother liquor; but the whole is not so produced. Unless, therefore, means could be devised for removing the deliquescent compounds which pre-exist

to a greater or less extent in the juice, the production of molasses could never be entirely suppressed, although it might be greatly diminished in amount, and the quantity of crystallized sugar increased in the same proportion, its colour and quality being at the same time so far improved as to enable it to compete for many purposes with refined sugar.

The imperfections of the common method of manufacture in use may now be noticed, and remedies suggested.

In the first place, the crushing-mills are imperfect and do not express the whole of the juice separable by such means. The spongy substance of the cane, retaining liquid with great obstinacy, requires a very good and careful adjustment of the rollers, and the means of regulating the rapidity of motion, to yield the maximum of juice, and these conditions are very far from being fulfilled by the powerful although rude windmills of Barbadoes. The result is, that instead of a quantity of juice making up 70 or 75 per cent. of the weight of the canes, the quantity yielded by mills of better construction, that obtained rarely exceeds 50 per cent. and sometimes falls below it. The total quantity probably amounts to 85 or 90 per cent., the whole of which of course cannot be obtained by any degree of pressure however powerful. Every endeavour, however, should be made to approximate to this point as nearly as possible. A loss of 20 or 30 per cent. of juice involves a loss of 20 or 30 per cent. of sugar. It will be wise economy, therefore, to spare no expense in providing a mill sufficiently perfect and powerful to do its duty. The power to be applied must depend upon circumstances, and will become a simple question of economy; provided it be sufficient and capable of regulation its nature matters little.

The common defecation process, in careful hands, seems susceptible of little improvement. Many other substances than lime have been proposed and tried with more or less

success,* some of which, in particular states of the cane juice, may prove very useful; but for general purposes nothing seems to answer so well as neutralization by lime, either in the form of lime-water or milk of lime, added until the slightest possible tendency to alkalinity, as ascertained by delicate reddened litmus-paper, is perceived. The juice should be somewhat heated before the lime is added, and afterwards raised quite to its boiling point. The fire is then to be withdrawn, and the whole allowed to rest a short time.

The next step is an innovation. It consists in filtering the juice before evaporation, with a view of removing the whole of the insoluble feculent matter. This may be done with the greatest ease. The cloth-filters employed by sugar-refiners, or in small works, a basket or perforated metal cullender, covered with a linen or woollen cloth, would suffice. A charcoal filter would no doubt be very efficacious, but more expensive and troublesome in use, and mechanical filtration only is really needed. The defecated cane-liquor would thus be obtained perfectly clear, which is never now the case, and on concentration would yield no scum: the labour of skimming and the loss of juice so carried away, would be avoided. The feculent matter on the filter might either be employed as ferment in the rum-distillery, or more advantageously transferred to the compost-heap as a most valuable manure. The progress of civilization and morals will probably bring about a diminished demand for rum, which already in many cases is only made for the purpose of employing materials difficult to dispose of, or which would otherwise be wasted, namely, molasses and the skimmings of the coppers. By improved methods of manufacture, however, the molasses might be diminished to an in-

* See Dr. Evan's Sugar Planter's Manual, a most valuable work, which should be in the hands of every one engaged with, or interested in, the manufacture of sugar.

significant quantity, which might find a ready market, or be advantageously used upon the estate in feeding stock, now so grievouslyly neglected, while the increased yield of sugar of superior quality, for which the demand at home might become almost indefinite, being only limited by the price, would amply remunerate the enterprising grower.

The filtered liquor must now be concentrated to syrup, which may be done over the open fire, or by steam of moderate pressure circulating in a spiral of copper pipe laid at the bottom of the evaporating vessel, which should be large and shallow, and as unlike as possible the tea-cup shaped coppers now in use. Here it may be boiled down rapidly until the temperature of ebullition rises to 225° or thereabouts, without injury to the syrup. When cold, it will then have a density of 1.33, or near it, and mark the 38th degree of Baumé's hydrometer. Beyond this point it will not be safe to go. The concentration of the syrup to the crystallizing point must be completed either by the vacuum-pan—the most perfect of all means, or by one of the several substitutes for that invaluable invention, of which an account will be found in Dr. Evan's *Manual*, and in other works on the subject. Among these, Gadesden's apparatus may be mentioned as having been used with some success on an estate near Bridgetown, the difference in colour and grain of the sugar made by this machine and that made by the old process over the open fire, at the same time and from the same canes, being quite extraordinary. The chief difficulty attending the use of the vacuum-pan in Barbadoes will probably arise from deficiency of water for condensation; by sinking wells, however, with the precaution required by the peculiar geological structure of the island, this may be overcome.

The old-fashioned flat shallow crystallizing vessels are exceedingly defective, inasmuch as they permit the too rapid cooling of the syrup, and thus hinder the formation of bold and distinct crystals essential to a good process.

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The confusedly crystalline pasty mass obtained drains with difficulty, and holds back the last portions of molasses with great obstinacy. This should be by all means avoided, a regular and distinct crystallization should be encouraged by collecting the concentrated syrup in deeper vessels, avoiding too much agitation, and allowing it to remain a longer time than usual before transferring it to the curing house, where it should be thoroughly and completely drained. Under the present system, the loss of molasses and sugar, the result of hasty and imperfect curing, is almost incredible. During the passage home, the leakage from the hogsheads into the hold of the ship is enormous; the bilge-pumps throw molasses almost as pure as that from the cistern of the sugar-boiler, and this it must be remembered is not simply an uncrystallizable mother-liquor containing the impurities of the cane-juice, but a syrup yet rich in crystallizable sugar. It is quite distressing to witness such culpable waste of that which has become one of the first necessaries of life, through the haste and carelessness of those who would reap the earliest and largest benefit from a better management. The fact is, that sugar should be sent home so dry, that it might be put in bags. It is already so with much of the foreign sugar now imported. Stove-drying might even be tried with advantage. At any rate, the present lamentable and wilful waste of property must be by some means or other avoided.

Again, the molasses-cistern of an ordinary sugar house has been with truth described as a receptacle for dirt and vermin. Sufficient attention is not paid to the preservation of that which has been collected; much of it is wasted and lost in various ways; the remainder being converted into rum, which, in many cases, from its inferior quality, cannot be exported, but gets consumed in the colony, being sold at a very low price to the working population, to which it becomes one of the most powerful and fertile sources of demoralization and ruin. This is notoriously the case in

Barbadoes, where the licensed dram-shops for the sale of this fiery poison exceed in number six hundred. The preferable method would be to collect it with care in puncheons as it flows from the sugar in the curing-house, and in this manner preserve it until after crop-time, that is, until the leisure time of the year, when it might be advantageously re-boiled in the vacuum-pan, and an additional quantity of sugar extracted.

To recapitulate: the attention of the intelligent and enterprising planter should be directed to the following points:

1. To obtain by the use of a properly constructed mill, the greatest possible amount of juice from the cane.

2. To clarify and filter this juice with expedition, and to evaporate it rapidly either over the open fire, or by steam-heat, as far as it can be done with safety.

3. To complete the concentration in a vacuum-pan, or by other means, at a moderate temperature, not hurtful to the sugar, and to facilitate the natural process of crystallization, so as to obtain a sugar of large and distinct grain.

4. To drain and dry the sugar perfectly, and to save all the molasses.

If the sugar be desired *white*, it can easily be obtained in this condition, by filtering through a bed of animal charcoal the thin syrup ready for the vacuum-pan, according to the practice of refiners, and by afterwards washing the crystals when thoroughly drained with white syrup. In this manner, raw sugar will be obtained almost equal in colour and purity to refined sugar, but at an increased expense, as the charcoal soon loses its decolourizing power, and requires re-burning, and the washing process consumes a considerable quantity of pure sugar. The propriety of adopting these additional measures will depend entirely on the price such whitened sugar bears in the market. At present an additional duty is levied on such; it is to be hoped, however, that this most injudicious increase, may, on a proper representation of the facts of the case, be remitted.

The most economical and advantageous mode of heating the vessels of a sugar establishment, would undoubtedly be by the use of steam—a single boiler, or set of boilers, according to the size of the works, furnishing steam to each, exactly as may be required, being shut off in a moment when no longer wanted, and directed elsewhere with equal ease. To heat the vacuum-pan, steam must be used; power is required to work the air pump, or to set in motion the wheel, in Gadesden's apparatus. To furnish enough steam to heat, in addition, the defecating and evaporating vessels, will not involve a very great increase of boiler-space or consumption of fuel, and will be attended with the very great advantage of permitting the application of the whole of the megass to the soil as manure. At present, coal cannot be landed at Barbadoes from England under 30s. or 35s. per ton; even at this high price its use would be, without doubt, economical. It might probably be obtained much cheaper from Cape Breton in British North America, or from the United States. The extensive exportation of coal from England is a policy so questionable, that diligent search should be made in other available quarters for this invaluable fuel, a scarcity of which may, ere very many more years have past, be felt at home.—*Pharm. Jour.*

ART. XIV.—ON THE MANUFACTURE OF OXALIC ACID.

By Mr. Lewis Thompson.

As no accurate account of the decomposition which ensues in the manufacture of oxalic acid has yet been published, that I am aware of, the following experiments may tend perhaps to draw attention to this subject.

The apparatus employed, consisted of a large glass retort, placed in a water-bath, and luted to a tubulated receiver, from the opening in which a tube passed into a two-necked

bottle, containing a solution of ammonia; this bottle was connected by a tube, with another of the same size and form, containing a solution of nitrate of lime, from which an exit tube passed, which dipped under water, and allowed the escape of the incondensible gaseous matter.

The temperature of the water-bath was maintained as nearly as possible at 125° Fahr., for forty-eight hours in each experiment, after which the solution of oxalic acid was set aside for two days to crystallize. The crystals were allowed to effloresce in a drying stove, so as to remove all excess of nitric acid; they were then dissolved, recrystallized, dried and weighed.

The amount of carbonic acid was determined by mixing the solutions of ammonia and nitrate of lime after each experiment, allowing the carbonate of lime to settle for twenty-four hours, after which it was washed, dried, and weighed. The sugar employed was the best refined white, and it lost nothing in weight by prolonged exposure to a temperature of 212°. The nitric acid was pure, and of specific gravity 1.245 at 60°; it contained as nearly as possible, one-third of its weight of dry acid, as was proved by the amount of pure carbonate of soda which it neutralized. The following table exhibits the results of eight experiments, showing the amount of sugar and dilute nitric acid employed, and the quantity of oxalic acid and carbonic acid produced. The liquor from the receiver and the mother-liquor of each experiment being added to the one following:

	EMPLOYED.		OBTAINED.	
	Sugar in ounces.	Dil. Nitric Acid in ounces.	Oxalic Acid in ounces.	Carbonic Acid in ounces.
No. 1	28	184	17½	20½
2	28	184	32¼	22¼
3	28	184	30	21
4	28	184	29½	21½
5	28	184	31¼	22
6	28	184	30½	21
7	28	184	30¼	21½
8	28	184	31	21½

A large quantity of mother-liquor remained, from which no crystals were attempted to be obtained, as these may be set against the small produce of experiment No. 1. If then we omit this experiment altogether, we shall have an average of the seven following, showing that 196 of sugar and 1288 of diluted nitric acid, have produced 214¾ of oxalic acid and 150¾ of carbonic acid, and that the proportion of carbon in the oxalic acid obtained almost exactly equals that in the carbonic acid, and that by the action of nitric acid in the way described, one-half of the carbon of any given quantity of sugar, is converted into oxalic acid, and the other half into carbonic acid. I have made many experiments with nitric acid of various densities and at various temperatures, but without obtaining in any instance so large a produce of oxalic acid, as with acid of the strength indicated. When strong acid is employed, the temperature rises too high, and a quantity of formic acid is occasionally produced, which distils over into the receiver, and materially diminishes the produce of oxalic acid. From these experiments it would appear that no more than 124lbs. of oxalic acid can be obtained from a cwt. of sugar. This, I am aware, is much below the quantity generally supposed to be produced on the large scale, and which is stated to vary from 135 to 140 lbs. for the cwt. of sugar; such acid is however contaminated with nitric acid and mother liquor, and is moreover decidedly damp, as shown by the manner in which the crystals cling to the sides of the bottle in which they are contained—some allowance must also be made for the tendency to exaggeration which prevails in our manufactories. Of this at least I am sure, that in some hundreds of attempts conducted on a pretty large scale, I have never once exceeded the amount here stated (124 lbs.) when the acid was properly purified and freed from adhering moisture. The following diagram in my opinion represents the nature of the ultimate decomposition which ensues in this manufacture, although other substances are unquestionably produced in the first instance :—

MATERIALS EMPLOYED.		ATOMS.		PRODUCTS.
Common Sugar 1 atom	Carbon	12	6	6 Carbonic Acid.
			6	
	Hydrogen	11	9	
			2	2 Water.
	Oxygen	11	2	
			9	
Nitric Acid 7 atoms	Nitrogen	7		7 Deutoxide of Nitrogen
	Oxygen	35	14	
			12	
			9	3 Crystalized Oxal. Acid.

These proportions do not greatly differ from those employed in practice by oxalic acid-makers, when allowance is made for the loss of nitric acid incidental to their mode of manufacture. The following is the general proportion of materials employed :—

Sugar	- - -	112 lbs.
Nitrate of potash	-	560 lbs.
Sulphuric acid,	- -	280 lbs.

which are said to produce 135 lbs. of oxalic acid, and 490 lbs. of sulphate of potash or sal enixum.

Experiment has proved to me that the first change produced, is to convert the cane-sugar into grape-sugar, and as the first portions of gas evolved consist almost entirely of nitric oxide with little or no carbonic acid, it is clear that some compound is generated in the commencement of this process, which contains the elements of sugar united to an excess of oxygen—the above diagram must therefore be looked on as merely explanatory of the ultimate change.—*Pharm. Journ.*

ART. XV.—ON A NEW AND PECULIAR SUBSTANCE CONTAINED IN ŒNANTHE FISTULOSA.

By M. Gerding.

This well-known umbelliferous plant gives off, when rubbed between the fingers in the fresh state, a peculiar narcotic odour. In attempting to isolate the narcotic principle, no result was obtained by distilling with caustic potash; I therefore extracted 20 lbs. of the fresh herb repeatedly with alcohol of 0.863 spec. grav. at the ordinary temperature, and freed the intensely-green extract from chlorophyle, &c. by acetate of lead. The liquid filtered from the green precipitate was of a light yellow colour, and possessed a still more penetrating odour, resembling turnips. The excess of lead was removed from the liquid by sulphuretted hydrogen, filtered, and then evaporated at a gentle heat to within one-eighth of its volume, when a peculiar resinous substance began to separate, which increased on further evaporation, so that the whole was finally converted into a syrupy, resinous, viscous mass, which amounted from 20 lbs. of herb to between 4 and 5 grms. The blackish-brown substance is somewhat tenacious, has an extremely disagreeable irritating taste, and a very penetrating narcotic odour, which is not easily got rid of from the hands. At 54° F. it is of a tenacious consistence; at a somewhat higher temperature it becomes soft, and begins to melt at 68°. It is not soluble in water, sparingly soluble in alcohol at the ordinary temperature, but perfectly soluble in 12 parts of it between 113° and 122°, equally in acetic acid at the same temperature, sparingly soluble in ether, and insoluble in sulphuric and hydrochloric acid; nitric acid destroys it, producing a red colour. I propose the name of *œnanthine* or œnanthic resin for this resinous substance.

This substance contains nitrogen, as ammonia was evolved on treating it with caustic potash; it was found impossi-

ble to crystallize it from alcohol. The alcoholic solution has an acid reaction. It affords with—

Chloride of Platinum, a yellow *crystalline* precipitate.

Perchloride of Mercury, a white percipitate turning gray.

Ammonia, a brown flocculent precipitate.

Potash produces a turbidness, and when added in large quantity separates the resin.

Carbonate of Soda produces a yellowish-brown pulverulent precipitate, as does *carbonate of ammonia*.

Nitrate of Silver causes a considerable reddish-brown precipitate.

Sulphuric Acid precipitates a brown powder, as does also *hydrochloric acid*, only the colour is somewhat more yellow.

A slight excess of ammonia added to a solution of the œnanthic resin in acetic acid produces a brown pulverulent precipitate, which possesses the chemical properties of the substance above described, but is not resinous. To this substance the author gives the name of *œnanthine*, and supposes it to be combined in the œnanthic resin with an acid; since on the distillation of an alcoholic extract of the resin, resin constantly separates in the retort during the operation, whilst above the level of the liquid a whitish ring is deposited, which is volatilized and passes into the distillate. This forms a white, milky, faintly-acid liquid, with an odour similar to the œnanthic resin, but considerably milder and more agreeable. The author supposes it to contain a volatile acid, but was prevented, from want of material, from extending his inquiries further on the subject. It has a powerful effect upon the animal system; half a grain administered to a full-grown person produces a long-continued irritation in the palate, followed by a hoarseness of two to three hours, duration; one grain sufficed to produce a slight vomiting. It may therefore prove interesting in a therapeutical point of view.—*Chem. Gaz. from Journ. für Prakt. Chem.*

ART. XVI.—ON THE ACID CONTAINED IN THE LEAVES OF ILEX PARAGUAYENSIS.

By Dr. F. Rochleder.

The leaves of this plant, known under the name of Paraguay tea, are used in South America in the same manner as tea in Europe and several countries in Asia. Stenhouse has found that the crystalline substance contained in it is identical in its composition and properties with caffeine. To ascertain the nature of the acid which accompanies the caffeine, in Paraguay tea, and furnishes the material for its formation, I examined a small quantity of the tea in the following manner:—The tea was rubbed to a powder, and exhausted in a stoppered vessel with alcohol of 0.951 spec. grav., which after some hours was replaced by a fresh quantity as long as it acquired a yellow colour. The yellow solution was precipitated with an alcoholic solution of acetate of lead, as long as the precipitate exhibited a somewhat dirty-yellow colour. This, separated by filtration, dries to a dark greenish brown mass. The yellow filtered solution is now entirely precipitated with an alcoholic solution of acetate of lead, and the beautiful yellow precipitate washed with alcohol upon the filter, suspended in alcohol, and decomposed with sulphuretted hydrogen. After expelling the excess of sulphuretted hydrogen, the liquid was poured into a large quantity of a solution of acetate of lead in alcohol, the precipitate washed with alcohol, and dried at 212°. This lead salt afforded on analysis the following numbers:—

Carbon - - - - - -	22.84	14 =	1050	22.63
Hydrogen - - - - -	2.20	8	100	2.15
Oxygen - - - - - -	15.64	7	700	15.10
Oxide of lead - - -	59.3	32	2789	60.12

Deducting the amount of oxide of lead, there remains, for the acid C 56.1, H 5.4, O 38.5, which is the composition of caffeo-tannic acid.

To convince myself of the identity of these two acids, I decomposed a portion of the lead salt which had been employed for the above analysis with sulphuretted hydrogen. The solution filtered from the sulphuret of lead was slightly yellow, acquired a dark reddish-yellow colour with ammonia, potash or soda, and was coloured dark green with perchloride of iron. Mixed with an excess of ammonia and exposed to the air, the liquid became dark green, which colour was converted into brown by the addition of acetic acid. The brown acid liquid afforded with a solution of acetate of lead a dark blue precipitate, which was coloured red by sulphuric acid. All these reactions agree with those presented by caffeo-tannic acid under the same circumstances; consequently the identity of the acid contained in the leaves of *Ilex Paraguayensis* with that existing in the berries of coffee is proved.—*Ibid. from Ann. der Chem. und Pharm.*

ART. XVII.—ON THE COLOURING MATTERS OF MADDER.

By Dr. Schunck.

On treating finely-ground madder roots with boiling water, a brown fluid is obtained having a taste between bitter and sweet. In order to extract all the substances capable of solution in water, about sixteen quarts of water are required for every pound of madder. To this fluid any strong acid, such as sulphuric or muriatic acid, is added in slight excess. Nitric acid must not be used for the purpose. Oxalic acid is best adapted, as it can afterwards be completely removed by chalk. The acid produces a dark brown precipitate, which is separated by filtration, and washed with water until the excess of acid is removed. The percolating fluid is yellow. This brown precipitate consists of seven

vegetable substances, viz. alizarine, rubiacine, alpha-resin, beta-resin, rubian, pectic acid and oxidized extractive. The examination of the fluid was next made; it was found to contain xanthic acid, madder-yellow and sugar. The continued investigation of the subject has led to the conclusion that there is but one colouring matter in madder, *i. e.* the alizarine; and that the substance which was thought to be a colouring matter, viz. rubiacine, is not so.

It is known that after madder has been employed for dying, it still contains colouring matter, and that the article garancine is manufactured from this. By treating this substance with boiling muriatic acid, it was found to contain lime, magnesia, oxalate of lime, phosphate of lime, alumina and peroxide of iron. After these salts were separated, boiling water extracted a large quantity of colouring matter, which would dye mordanted cloth quite full, and of the same colour as madder itself, thus showing that it contains alizarine. Alizarine is found to be composed of—

Carbon - - - - - - -	56.97
Hydrogen - - - - - -	4.19
Oxygen - - - - - - -	38.84

or, in fact, of carbonic acid and water. Alizaric acid is formed by treating alizarine with concentrated persalts of iron or nitric acid. The salts of this acid are mostly soluble. Alizarate of lime is prepared by neutralizing alizaric acid with carbonate of lime, and evaporating to crystallization. It crystallizes in prisms possessing great brilliancy. Alizarate of baryta, prepared in the same way by means of carbonate of baryta, crystallizes in silky needles. Alizarate of silver, prepared by double decomposition, is soluble in boiling water, from which it crystallizes as the solution cools. Alizarate of lead is insoluble. By subjecting alizaric acid to heat, it is volatilized, and forms a sublimate in the shape of long white needles, to which the name of pyro-alizaric acid is given. By solution in water, pyro-alizaric acid appears to be again converted into alizaric acid. Rubiacine was

found to be $C^{31} H^9 O^{10}$, and rubiacic acid $C^{31} H^9 O^{16}$. Alpha-and beta-resin were next examined, as were also the other constituents; and the author then proceeded to examine the part which each material plays in the process of dyeing; from which it is satisfactorily proved that alizarine is the substance producing colour; and the advantages of converting madder into garancine consist in removing the resins and those bodies which are not only useless but injurious, and in separating alizarine from those salts with which it exists in the madder root in close combination.—*Chem. Gaz.*

ART. XVIII.—ON COMMON SALT AS A POISON TO PLANTS.

By W. B. Randall.

The following notice is presented as being likely to afford a useful practical caution to those interested in the cultivation of plants. In the month of September last, three or four small plants in pots were shown to the writer, nearly or quite dead; and he was at the same time informed that their destruction was a complete mystery to the party to whom they belonged, and that Dr. Lindley had expressed his opinion, from the examination of a portion of one sent to him, that they were poisoned. Having searched in vain for any strong poison in the soil, and in the plants themselves, he inquired more minutely into the circumstances of the case, and found that these were only specimens of many hundreds of plants both in the open air and in green-houses (but all in pots), which exhibited in a greater or less degree, the same characteristics. The roots were completely rotten, so as to be easily crumbled between the fingers; the stems, even in young plants, assumed the appearance of old wood, the leaves became brown, first at the point, then

round the edge, and afterwards all over; while the whole plant drooped and died. At least 2000 cuttings, in various stages of progress, and 1000 strong healthy plants, had been reduced to this condition, including different varieties of the fir, cedar, geranium, fuchsia, rose, jasmine and heath. The sight of this wholesale destruction, coupled with the fact that the whole were daily watered from one particular source, suggested the conclusion that the cause of the evil must reside in the water thus used; and this was accordingly examined. It yielded the following constituents, making in each imperial pint of 20 fluid ounces nearly 9½ grains of solid matter entirely saline, without any organic admixture :—

Carbonate of lime - - - - - -	0.600
Sulphate of lime - - - - - -	0.462
Chloride of calcium - - - - - -	0.200
Chloride of magnesium - - - -	1.252
Chloride of sodium - - - - - -	6.906
	9.420

The mould around the plants and infusion of the dead stems and leaves also afforded abundant evidence of the presence of much chloride of sodium. Further inquiry showed that the well from which the water was procured had an accidental communication, by means of a drain, with the sea; and thus became mixed with the salt water from that source, and had been used in this state for some weeks, probably from two to three months. From about that time the plants had been observed to droop; but it was not until nearly the whole of a valuable stock had been destroyed, that any extraordinary cause of the evil was suspected. To place it beyond doubt that the water was really the cause of the mischief, twelve healthy fuchsias were procured from a distance, and divided into two parts, half being watered morning and evening with the water in question, and the others with rain-water. In a week the six plants watered from

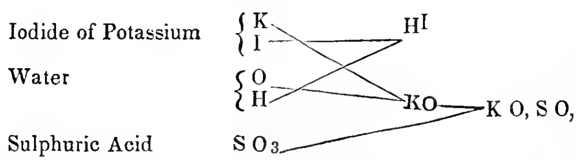
the well had turned brown, and ultimately died, while all the rest remained perfectly flourishing. Assuming from these facts, that the common salt in this water was the chief cause of the results described, it is proved that water containing about 7 grs. of salt in each pint is, in its continued use, an effectual poison to the weaker vegetation; or that when a soil is continually watered with a weak solution of salt, it gradually accumulates in it until the soil becomes sufficiently contaminated to be unfit to support vegetable life. In either case an interesting subject of inquiry is suggested—What is the weakest solution of salt which can produce in any measure this poisonous effect? or, in other words, at what degree of dilution does the danger cease? For salt is an important natural constituent of much spring water, quite independent of any infiltration from the sea, as in this instance. Thus, the water of the artesian well, Trafalgar-square, London, contains in each gallon about 20 grs.; that at Combe and Delafield's brewery, 12.; that at Wolverhampton Railway Station, 6; one lately sunk at Southampton, for supplying a private manufactory, 40. May it not be asked, whether the subject of the suitableness of waters in general for the various purposes to which they are applied, be it in manufactures or for steam-engines, domestic purposes or drinking, is not worthy of a greater share of scientific attention than it has hitherto commanded?—*Ibid.*

ART. XIX.—PHARMACOPŒIA TEST FOR IODIDE OF POTASSIUM.

A Correspondent, D. B., of Aldersgate Street, has directed our attention to one of the tests described in the notes to the Pharmacopœia for *Iodide of Potassium*, which is thus expressed,—"*Sulphuric acid and starch, added together, it becomes blue.*" "The truth is," says our correspondent "that the above is a test of the impurity, not of

the purity, of the article, for on adding sulphuric acid and starch to a solution of *pure* iodide of potassium, the blue colour is not produced ; but if the specimen contain iodate of potash or free iodine, the blue colour will be developed."

This subject had been previously brought under our notice. It appears that some iodide of potassium was recently condemned by a purchaser as bad, the manufacturer being told, to his astonishment, that it contained no iodine, the test described in the Pharmacopœia having failed to indicate the presence of that body. It was found, however, that the only peculiarity in the salt consisted in its being very pure. On adding sulphuric acid to a solution of pure iodide of potassium, water is decomposed together with the salt, yielding sulphate of potash and hydriodic acid, as represented in the following diagram :—



Hydriodic acid (H I) is a colourless compound which does not affect the colour of starch, and therefore, on adding starch to the above mixture the blue iodide of starch is not formed. But hydriodic acid is a very unstable compound; it speedily undergoes decomposition, iodine being set free, which colours the solution and gives the characteristic blue colour with starch. If, therefore, instead of adding the sulphuric acid and starch *together*, the acid be added first, and the mixture allowed to stand for some minutes before the addition of the starch, the presence of the iodine will be made manifest. It might be supposed that the same effect would ensue if the acid and starch were added simultaneously, and the mixture allowed to stand for some time, but experience shows that this method of applying the test will not answer.

It is evident from what has been stated, that the Pharmacopœia test is a bad one. Sulphuric acid is not the best

substance to use for decomposing the iodide of potassium and setting free the iodine. Nitric acid might be used with better success, especially if it contain nitrous acid, as it generally does; but chlorine water, or gaseous chlorine, will be found to be better than either, the whole of the iodine being thus instantly set free. The best method of applying the test is to make a weak solution of the salt to be tested in distilled water, to add to this some cold solution of starch, to allow some chlorine gas to flow from the mouth of a bottle on to the surface of it, and so slightly agitate the liquid. The blue compound will thus be instantly developed. It is not necessary that the chlorine used for this purpose should be pure; the gas occupying the upper part of a bottle containing chlorine water, will answer the purpose perfectly well, the stopper being removed, and the bottle partly inverted over the edge of the test-glass, so that the heavy gas may flow out. This is the most delicate way of testing for the presence of iodine, and should be adopted where the quantity to be detected is very small; but in applying the test to iodide of potassium, delicacy of indication is not required, as iodine is, or ought to be, the the most abundant constituent of the salt. Chlorine water, or reddened nitric acid, might, therefore, be used in this case with the same effect as gaseous chlorine.

Our correspondent is correct in saying that the Pharmacopœia test does not indicate the purity, but the impurity of the salt. The test could not have been intended for the detection of impurities, but merely to show that iodine is present; yet it has happened, unfortunately, that when applied according to the instructions of the Pharmacopœia, it fails to afford even this indication, if the salt be perfectly pure. Perfectly pure iodide of potassium, however, is rarely met with in commerce. The process by which the salt is usually made by manufacturers, consists in heating together a solution of caustic potash and iodine, in which case iodate of potash is necessarily produced at the same time as the iodide; and although the salt is subsequently

exposed to a dull red heat, with the view of decomposing the iodate, yet there is generally a small portion of iodate left in the product, the presence of which causes the immediate liberation of iodine on the addition of sulphuric acid.

Thus, although the Pharmacopœia test is inefficient for the detection of iodine in pure iodide of potassium, yet it answers very well with the iodide usually met with in commerce, the characteristic reaction being caused by the presence of even a minute portion of iodate of potash, which would not interfere with the medical action of the salt.—*Pharm. Journ.*

ART. XX.—ON THE ACTION OF ACIDS UPON AMYGDALINE.

By Professor Wöhler.

The composition of amygdaline is expressed by the formula $C^{40}H^{27}NO^{22}$. There is very little doubt that it is one of the so-called conjugate compounds. From the circumstance that it is separated by the influence of emulsine into sugar, prussic acid and oil of bitter almonds, it might be suspected that it really contains these substances as proximate constituents, for—

1 equiv. oil of bitter almonds	$C^{14}H^{6}O^{2}$
1 equiv. prussic acid	$C^{2}HN$
2 equivs. sugar	$C^{24}H^{20}O^{20}$
give 1 equiv. amygdaline	$C^{40}H^{27}NO^{22}$

But it might also be regarded as a combination of the protocyanide of benzoyle, $C^{14}H^{5}+C^{2}N$, with 2 atoms of gum:—

1 equiv. benzoyle	$C^{14}H^{5}$
1 equiv. cyanogen	$C^{2}N$
2 equivs. gum	$C^{24}H^{22}O^{22}$
	$C^{40}H^{27}NO^{22}$

On its metamorphosis, the elements of 2 atoms of water would separate from the gum and pass to the protocyanide of benzoyle, when the gum would appear as sugar, and the cyanide of benzoyle, in the form of prussic acid and oil of bitter almonds.

The action of acids upon amygdaline agrees perfectly well with both views; it is converted by them into formobenzoilic acid and a humus-like substance, while the whole of the nitrogen is separated in the form of an ammonium salt; the same decomposition consequently takes place as prussic acid and sugar of gum experience by acids. Sugar or gum yields the humus-like substance, and the formic acid produced from the prussic acid combines with oil of bitter almonds to form formobenzoilic acid. I have examined this reaction, it is true, only with muriatic acid; but undoubtedly all the stronger acids would act in a similar manner.

A solution of amygdaline in fuming muriatic acid soon acquires on heating a yellow, and then a brown colour, and on the further application of heat, a large quantity of a blackish-brown, pulverulent, humus-like substance separates. On filtering the humine, and evaporating the brown liquid in the water-bath, a blackish-brown syrupy mass remains, which is a mixture of humic acid, chloride of ammonium and formobenzoilic acid. The latter can be extracted with ether, and obtained in large tabular rhombohedrons. Its solution immediately disengaged carbonic acid and oil of bitter almonds when heated with manganese; moreover, the analysis of the acid and of its crystalline silver salt proved it to be formobenzoilic acid. On evaporating the acid liquid at a higher temperature than 212°, a portion of the formobenzoilic acid experiences an alteration, which deserves further examination. It becomes amorphous, forms a solution with a small quantity of water, but is precipitated, on the addition of more water, as a heavy yellowish oil without odour. The same change was observed with formobenzoilic acid prepared from bitter almond

water. A quantity of crystallized chloride of ammonium was obtained from the mass which had been exhausted with ether.

In the hope of producing directly from amygdaline the ether of formobenzoilic acid, which is still unknown, muriatic acid gas was passed into a mixture of alcohol and amygdaline. In proportion as the mass became saturated with it and heated, the amygdaline gradually dissolved to a clear solution, and nothing separated on cooling. The gum products were not formed in this case, and the liquid acquired but a very faint brownish tint. After some days a powder separated, which proved to be chloride of ammonium, more of which separated on the addition of ether. On the addition of a large quantity of ether, an aqueous acid liquid separated, which contained the chloride of ammonium, but no sugar. After it had been repeatedly shaken with ether, the ethereal solution was removed, and the ether distilled off. It left a brown syrup, which on mixture with water sank as a heavy liquid to the bottom. I have not examined this substance more minutely, but it may be considered with great probability to be the ether of amygdalic acid, produced by the sugar or gum in the amygdaline not being converted into humine, but entering into combination with the generated formobenzoilic acid; for the composition of amygdalic acid, $HO + C^{40} H^{26} O^{24}$, is such that it may be looked upon as a combination of—

1 equiv. oil of bitter almonds	$C^{14} H^{6} O^{2}$
1 equiv. formic acid	$C^{2} H O^{3}$
2 equivs. sugar	$C^{24} H^{20} O^{20}$

Amygdalic ether is undoubtedly colourless in the unaltered state. Obtained in the above manner, it is light brown, heavier than water, not miscible with it, but soluble in it to a considerable extent, especially on the application of heat, when however it is decomposed. It has a bitter, somewhat astringent taste, and is but slightly or not at all volatile.—*Chem. Gaz. from Liebig's Annalen.*

ART. XXI.—NOTICE RESPECTING AMIDULINE.

By Prof. F. Schulze.

I have applied the above name to a modification of starch which forms the transition between true starch and inuline or dextrine ; it is an intermediate stage, which precedes all the metamorphoses of starch into dextrine, and is characterized by being readily and entirely soluble in hot water. It again separates from the concentrated aqueous solution after a longer or shorter time, owing to its insolubility in cold water; it reacts with iodine like starch.

This compound calls to mind Jacquelin's amylum granules, with which it is perhaps identical. It is distinguished from inuline by its reaction with iodine, and by not being converted into sugar on boiling its aqueous solution. It resembles dextrine in its solution, deviating the plane of polarization considerably to the right. It exhibits no reaction with lime and barytic water, nor with basic acetate of lead, and differs consequently in this respect from the so-called solution of starch.

With respect to the preparation of this substance, the same method is followed as for dextrine, only, with this difference, that the boiling of the mixture of sulphuric acid, water and starch is discontinued as soon as the starch is dissolved.

The acid is neutralized with carbonate of lime while the liquid is still hot. After the lapse of some time, frequently of several days, the amiduline separates in flakes easy of filtration, and which on drying assume all the appearance of white sago. Its elementary composition agrees exactly with that of starch.—*Chem. Gaz. from Journ. für Prakt. Chem.*

ART. XXI.—ON THE APPLICATION OF CHLORIDE OF AMMONIUM IN ANALYTICAL CHEMISTRY.

By Prof. H. Rose.

Prof. Rose recently drew attention to the very great use that might be made of the chloride of ammonium in quantitative analysis, from its converting several metallic oxides, when heated with them, into chlorides; the more volatile chlorides escape, and can thus be separated from the less volatile. Not merely oxides, but likewise several sulphurets are converted by chloride of ammonium into chlorides; for instance, the sulphurets of antimony, arsenic, tellurium and tin. The following additional observations respecting the behaviour of various bodies towards chloride of ammonium have been since published:—

Titanates.—When titanic acid is calcined with chloride of ammonium, the ammonical salt is driven off, and the titanic acid does not decrease in weight.

Titanic acid forms with the alkalies only acid insoluble salts; they dissolve in hydrochloric acid, except when deprived of their water by a red heat; they are then perfectly insoluble. It is consequently very difficult to ascertain their composition, especially when it is desired not to determine their amount of water by the loss. However, this is very easily accomplished by treating them with chloride of ammonium. The amount of water is first determined by ignition, the calcined compound mixed with sal-ammoniac, the mixture heated to redness, and this operation repeated until no further increase in weight results. While the titanic acid continues unaltered, the alkali exchanges its oxygen for chlorine, and the entire composition of the anhydrous salt can therefore be calculated merely from the increase in weight, for the difference between the atomic weight of the

oxygen and chlorine is to the atomic weight of chlorine as the increase in weight to the amount of chlorine in the mass treated with sal-ammoniac; but from this amount of chlorine that of the alkaline metal can be obtained, and also that of the titanic acid.

This determination can be checked in a very simple manner by treating the mass calcined with chloride of ammonium with water, which dissolves the alkaline chloride, the amount which can be determined by evaporation, while the titanic acid remains undissolved.

It resulted from the experiments made on this subject, that the potash salt dried at 212° has the formula $KO, 6TO^2 + 3HO$, and the soda salt $2NaO, 9TiO^2 + 5HO$. The first forms a powder, which appears perfectly crystalline under the microscope, and consists of vitreous fragments.

Sulphates.—The alkaline sulphates are completely decomposed on ignition with chloride of ammonium into alkaline chlorides, from the weight of which the amount of the sulphate can be accurately estimated. Sulphate of baryta is likewise decomposed by chloride of ammonium; but it is almost impossible to render the decomposition complete, because the chloride of barium formed melts, and so protects the undecomposed sulphate of baryta from further decomposition. Sulphate of magnesia is not decomposed by chloride of ammonium.

Seleniates.— Seleniate of baryta is converted, on calcination with chloride of ammonium, into a mixture of selenite of baryta and chloride of barium, which is coloured brown by free selenium.

Alumina Compounds.—Calcined alumina, rubbed to a fine powder, is for the greater part volatilized by treatment with sal-ammoniac. A small portion, however, of coarser nature, most tenaciously resists the action of the chloride of ammonium; and the alumina finally acquires, by the long ignition, such a state of density that it cannot be further decomposed by chloride of ammonium. Sulphate of alumi-

na, calcined with chloride of ammonium, is volatilized without leaving a residue.

Potash alum is completely decomposed; however, it does not leave pure chloride of potassium, but the sparingly volatile double compound of chloride of aluminum and chloride of potassium.

Glucina.—The compounds of this earth closely resemble those of alumina in their behaviour towards chloride of ammonium. The loose carbonate of glucina is more quickly decomposed by chloride of ammonium than the earth precipitated by ammonia; but even the former cannot be entirely volatilized by frequent treatment with chloride of ammonium. The more frequently the earth is heated to redness, the more it resists further decomposition.

Peroxide of Iron.—When mixed with chloride of ammonium and heated to redness, the mixture fuses, and readily flows over the crucible. A considerable quantity of iron is volatilized in red vapours as perchloride; and on the sides of the crucible peroxide of iron is deposited in a crystalline state, produced from the chloride by oxidation.

Manganese.—The oxides of this metal are converted, by treatment with chloride of ammonium, into protochloride, in which by oxidation some protoperoxide is formed.

Oxide of Nickel and Cobalt are converted into the metallic state when calcined with chloride of ammonium. The arseniuret of nickel (*Nickelspeise*) is, on the contrary, only partially decomposed, the arsenic being volatilized and the nickel left as chloride.

Oxide of Bismuth is reduced, with a lively deflagration, to metallic bismuth.

Silver Compounds.—Chloride of silver, mixed with chloride of ammonium and calcined, experiences no change; oxide of silver, heated to redness with chloride of ammonium, leaves both metallic silver and chloride. By the first action of the heat a portion of the oxide is reduced to metallic silver, which is not altered by ignition with sal-ammo-

niac; that portion of the oxide which has not been reduced by the heat before the chloride of ammonium begins to act is converted into chloride of silver. Antimoniuret of silver (the native coarse-grained mineral from Wolach, $Ag^2 Sb$) is but imperfectly decomposed by chloride of ammonium; by repeated treatment it is most probable that metallic silver would remain, since the more frequently it is calcined with chloride of ammonium, the more the antimoniuret of silver decreases in weight, and the residue becomes less brittle.

Lead Compounds.—Oxide of lead, calcined with chloride of ammonium, is converted into chloride of lead, which, on the access of air and the repeated addition of chloride of ammonium, may be entirely volatilized. Sulphuret of lead, calcined with sal-ammoniac, gives a fused blackish-brown residue, which is a compound of chloride and sulphuret of lead, and which, on the access of air, gives off dense vapours of chloride of lead, and may be wholly volatilized by the repeated addition of sal-ammoniac.

Oxide of Zinc is entirely volatilized as chloride of zinc when mixed with chloride of ammonium, but with great difficulty when the air is excluded.

Sulphate of zinc, deprived of its water of crystallization and calcined with chloride of ammonium, froths up very considerably. By repeated treatment with chloride of ammonium the residue can be wholly volatilized.

Oxide of Chromium and Crhomates.—The first experiences no change by calcination with chloride of ammonium, but the alkaline chromates leave a mixture of oxide of chromium and alkaline chloride; the latter dissolves on treatment with water, while the former is left undissolved. The alkaline chromates may be easily and accurately analysed by this method. The double sulphate of potash and oxide of chromium, after being deprived of its water, is converted into a mixture of oxide of chronium and chloride of potassium on ignition with sal-ammoniac.

Silicic Acid.—Silicic acid, which has not been heated too

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strongly, decreases somewhat in weight on treatment with chloride of ammonium; but by long ignition it attains such a state of density as to withstand the action of sal-ammoniac. Crystallized silicate of soda in the anhydrous state is barely decomposed by ignition with chloride of ammonium.

Phosphates.—Phosphate of soda, calcined with chloride of ammonium, increases in weight; however, the weight of the residue diminishes by further treatment with sal-ammoniac, but still remains greater than that of the phosphate employed. A partial decomposition takes place; chloride of sodium is formed, and some phosphoric acid is expelled as hydrochloric acid by the phosphoric acid under the influeace of the air and moisture, whence the alternating increase and decrease in weight. Phosphate of lime is not decomposed by ignition with sal-ammoniac.

Compounds of Antimony.—The author has already shown that the antimony can be entirely expelled from the alkaline antimoniates by chloride of ammonium, and the alkali determined with accuracy as chloride. The combination of the alkaline sulphurets, especially the sulphosalt, consisting of sulphuret of sodium and sulphuret of antimony, commonly known by the name of Schlippe's salt, may be exceedingly well analysed by chloride of ammonium. In the case of this salt, pure chloride of sodium was left entirely free from every trace of antimony and sulphur.

Arseniates.—That alkaline arseniates are most readily converted by chloride of ammonium into alkaline chlorides has been already shown. The arseniate of lime, after calcination, leaves chloride of calcium, but the arseniate of magnesia is scarcely affected by treatment with sal-ammoniac. Sulphate of ammonia appears to decompose it entirely; however, this ammonical salt is not so well adapted for analytical purposes, as it fuses when heated and froths violently, rendering it difficult to prevent the mass flowing over the crucible.

Borates.—Borax is not affected by calcination with sal-

ammoniac; the latter escapes on the application of heat before the borax begins to fuse.

Fluorides.—Fluoride of sodium is decomposed by calcination with chloride of ammonium; it is however with great difficulty. The layer of fused chloride of sodium protects the still-undecomposed fluoride from further decomposition by chloride of ammonium. Fluoride of calcium is still less easily decomposed.

Bromides.—Bromide of sodium is decomposed, but not completely, by calcination with chloride of ammonium. When the treatment is frequently repeated, the residue consists principally of chloride of sodium, but always contains a considerable amount of bromide.

Iodides.—Iodide of potassium is decomposed by ignition with chloride of ammonium; but it is not entirely converted into chloride of potassium, even when the treatment is frequently repeated.

It is remarkable, that not only is chloride of ammonium incapable of decomposing the bromides and iodides completely, but also that it behaves exactly in the same manner towards fluorides, the partial decomposition of which by chloride of ammonium was not to be expected.

Nitrates.—Nitrate of potash is easily and entirely decomposed by chloride of ammonium, and yields accurately the the amount of chloride of potassium corresponding to the salt.—*Chem. Gaz. from Proc. of Berlin Academy.*

ART. XXIII.—ON SOME OF THE PROXIMATE PRINCIPLES OF VEGETABLES, THEIR NATURE, AND A NEW METHOD OF PREPARING THEM. By M. Lebourdais.

In 1825 I commenced a numerous series of experiments, with a view to obtain the proximate principles I imagined must exist in the Columbo root, the bulbs of *Scilla*, the the leaves of *Digitalis*, of *Ilex*, the flowers of *Arnica*, &c.

These experiments, although without satisfactory results, were nevertheless continued until 1840, when I gave up the use of chemical reagents, and resolved to try some substance which, possessing both a chemical and mechanical action, would have a kind of elective affinity, so as to seize hold of certain substances and eliminate others. After numerous experiments, I tried animal charcoal with perfect success. My first experiments with this reagent were made on a spirituous extract of Digitalis. The solution, which was not very highly coloured, having been previously precipitated with acetate of lead and filtered, was agitated with animal charcoal and the flask containing the mixture set aside; to my great astonishment, the liquid, on depositing the charcoal, had become not merely colourless, but had entirely lost its bitter taste. I decanted the liquid and washed the charcoal with distilled water, dried it in the stove, and then treated it with boiling alcohol, which acquired a pale tint, and took up the whole of the bitter principle. The alcohol, on evaporation in the water-bath, left at the bottom of the vessel an amber-coloured liquid, which deposited a pulverulent substance, the quantity of which increased after some time and cooling. This new substance, separated and washed, dissolved in alcohol, and furnished by its spontaneous evaporation crystals of digitaline. The crystals dissolve, but in small quantity, in water, to which they communicate a very bitter taste; they are more readily soluble in weak than in strong alcohol, and more so in hot than in cold. Ether has but little action upon digitaline. Both the alcoholic and the aqueous solution are neutral, as they have no action upon blue litmus-paper and upon that which has been reddened by an acid.

Sulphuric acid dissolves digitaline, and this solution finally acquires suddenly a very beautiful purple colour. After a time this colour disappears, passing into a brown, and a precipitate forms in the liquid of a blackish substance, produced by the decomposition of the proximate principle. If

the purple solution of digitaline in sulphuric acid is diluted with water, it instantly loses its colour, and acquires a yellowish-green one, resembling that of chlorine. Concentrated nitric acid dissolves it without assuming any colour; the same is the case with hydrochloric acid. No precipitate is formed by pouring ammonia into solutions of digitaline. The same was found to be the case with acetate of lead, lime-water, potash and soda. Digitaline did not appear to to me contain any nitrogen.

This process having furnished me with a very satisfactory result, I applied it, with certain modifications, to isolate other proximate principles, and always with success.

Ilicine.—2 lbs. of powdered holly-leaves, treated with boiling water, furnished a greenish decoction, which was very bitter; the liquid was decanted, filtered, and boiled with animal charcoal, being stirred constantly. On removing the flask from the fire, the charcoal subsided, and the liquid, which had lost its colour and much of its taste, was decanted. The animal charcoal was washed, boiled, and treated with boiling alcohol, to which it imparted the bitter taste of the holly; the liquid was filtered, and the alcohol removed by distillation, when a colourless inodorous liquid remained at the bottom of the vessel, of a very bitter taste and a syrupy consistence. This solution was neutral; it furnished, on spontaneous evaporation or in the stove, a solid amorphous substance, of the appearance of gelatine, to which I have given the name of Ilicine. It is soluble in water and in alcohol; and although not hygrometric, I have not been able to obtain it in the crystalline state.

Scillitine.—A concentrated, highly-coloured and vicious decoction of the bulbs of squills was precipitated by acetate of lead (the viscosity of the liquid preventing the precipitation of the animal charcoal), and filtered. The resulting liquid was agitated in the cold with animal charcoal, and the vessel containing the mixture set aside; gradually the animal charcoal subsided, and carried down with it the bitter and colouring principles; the liquid was decanted, and

the charcoal washed, dried and treated with hot alcohol, which became excessively bitter. After filtration the alcohol was removed by distillation, when a milky liquid remained in the retort, in which floated numerous minute particles of a whitish substance, sparingly soluble in water, to which it nevertheless imparted an intense bitter taste; it dissolved readily in alcohol, and the solution left an amorphous residue on spontaneous evaporation. The milky liquid evaporated in the hot chamber gave the same result. This substance is neutral, does not absorb moisture from the atmosphere, and produces on the tongue a sensation analogous to that caused by a caustic substance. Scillitine, as thus obtained, is solid, is readily decomposed by heat, dissolves in concentrated sulphuric acid, and appears to communicate to the solution a purple colour, which instantly disappears, and turns black, owing to decomposition. It is also dissolved by nitric acid, but decomposed at the same time.

Arnicine.—A concentrated infusion of the flowers of *Arnica montana* was gradually filtered through a thick layer of animal charcoal, which had been previously washed. The filtered liquid was deprived of the bitter and colouring principles. The charcoal, after being washed and dried, was treated with alcohol, to which it imparted the bitter taste of the arnica. The alcoholic solution was filtered, and submitted to distillation; it left a milky liquid, which furnished on evaporation a substance having the appearance and consistence of turpentine. It is but very sparingly soluble in water, but nevertheless imparts to it a bitter taste. It dissolves in every proportion in alcohol; the solution, on spontaneous evaporation, leaves a residue of a syrupy consistence. Arnicine is neutral. Acetate of lead must not be used in the preparation of this substance, as the precipitate carries down with it nearly the whole of the arnicine.

Columbine.—An aqueous infusion of the Columbo root, obtained by displacement, was filtered through a thick stratum of animal charcoal; in its passage it was deprived of its

bitter taste and colour. The charcoal, after being washed and dried, was treated with alcohol, to which it communicated the colour and taste of the Columbo. This solution deposited minute crystals of columbine on spontaneous evaporation. If, instead of treating the charcoal with alcohol, a stream of water is passed through it as long as the liquid which filters has a bitter taste, the columbine is removed, but not the colouring substance, which may now be obtained separately by digesting the charcoal with alcohol. The columbine may thus be obtained perfectly pure and crystalline.

Colocynthine.—A concentrated infusion of the parenchyma of the fruits of the colocynth was first precipitated with acetate of lead, filtered, and treated in the same manner as for the preparation of columbine. The solution obtained on spontaneous evaporation deposited the colocynthine in mammillated tufts.

Strychnine.—An infusion of nux vomica, treated in the same manner as the Columbo, furnished strychnine, with all the physical and chemical characters of that obtained by the processes hitherto employed—a proof of the pre-existence of alkaloids in vegetables.

Of the substances upon which I experimented only the three last were found to possess the property of combining with animal charcoal, and then leaving it when treated with water, and on treating this solution with charcoal again uniting with it.

The juices of hyoscyamus, hemlock, &c., treated in the same manner as the flowers arnica, yielded the principles of these plants, some in an amorphous, others in the crystalline state. Wishing to confirm as much as possible the undoubted existence of certain proximate principles in vegetables in the alkaloid state, I prepared morphine, narcotine and quinine by the same method. The experiments to obtain the latter appear to me to be conclusive.

500 grms. of *Cinchona calisaya* were exhausted with water, acidulated with sulphuric acid, and the acid decoc-

tion filtered through washed animal charcoal. The liquid after having traversed the layer of animal charcoal, was insipid and colourless. The charcoal was washed and dried, and treated with alcohol of 0 848 spec. grav.; the alcoholic solution furnished, on evaporation in the water-bath, a milky liquid, and the sides of the vessel were covered with crystals of quinine. The milky liquid turned red litmus-paper blue, and on treatment with sulphuric acid furnished sulphate of quinine.

To avoid the objection that might be made with regard to the action of the sulphuric acid on the lime-salts contained in the animal charcoal, I proceeded as follows:—500 grms. of the same bark were deprived of their soluble principles by repeated macerations in alcohol of 0.928, the resulting liquids filtered, the alcohol removed by distillation, the liquid residue mixed with two decoctions of the same bark in distilled water, the mixture filtered through paper, and then through animal charcoal which had been previously deprived of the salts of lime, &c., by hydrochloric acid, and well washed. The liquid passed slowly through the charcoal, and was deprived of its bitter taste and colour. This charcoal was now washed, dried, and treated with alcohol of 0.848. The alcoholic solution left on distillation a mixture of quinine and resinous substance. To obviate this inconvenience, I repeated the preceding operation, adding to the mixture of the alcoholic macerations and aqueous decoctions a certain amount of acetate of lead, which precipitated the resinous substance. The liquid, filtered from this precipitate and treated as above, furnished the quinine in a state of perfect purity.

These experiments, besides proving the pre-existence of certain alkaloids in plants, open a new path of organic analysis, and complete in some measure the study of the principal properties of animal charcoal.—*Ibid, from Ann. de Chim. et de Phys.,*

Editorial Department.

The Cholera.—The foreign journals teem with statements relative to the progress of this fearful epidemic, exposing its ravages from city to city, as it involves one nation after another in its dreaded influence, without being retarded, apparently, in the slightest degree by the strictest quarantine, and only modified in its deadly effects on the communities, by the general sanitary measures that may, collectively and individually, have been adopted. Whilst Moscow and Constantinople were being scourged, the press of England was alive to arouse the municipal government to the adoption of means of protection or amelioration, and the government seems to have seized on the idea, as, by the appointment of a general "Board of Health," consisting of Lord Morpeth, Lord Ashley, and Mr. Chadwick, they have opened the door to a more extended and thorough sanitary reform. Eminent physicians have been consulted, and a pamphlet of directions and advice, relative to the precautions to be observed in the removal of all causes of miasm, and in the treatment of cholera in its incipient stages, when timely interference by even the unprofessional is of great value. It is made the duty of the Guardians of the Poor and parochial authorities to visit the premises in their districts, to see that the measures of the Board are carried out.

They say: "The chief predisposing causes of every epidemic, and especially of cholera, are damp, moisture, filth, animal and vegetable matters in a state of decomposition; and, in general, whatever produces atmospheric impurity." "Next to the perfect cleansing of the premises, dryness ought to be carefully promoted, which will of course require the keeping up of sufficient fires, particularly in the damp and unhealthy districts, where this means should be resorted to for the sake of ventilation as well as of warmth and dryness."

After enlarging on these precautionary sanitary measures, they direct attention to the importance of combating the first premonitory symptoms of the disease without delay, which are thus described: "This premonitory symptom is looseness of the bowels, which there is reason to regard as universally preceding the setting in of the more dangerous stage of the disease. Sometimes, indeed, under the circumstances

already described—namely, where the poison exists in unusual intensity—or the constitutional predisposition is unusually great, the first stage may appear to be suppressed, as occasionally happens in violent attacks of other diseases; but in cholera, this event is so rare, as to be practically of no account; and in all countries, and under all varieties of conditions in which this disease has been epidemic, the experience as to this point uniformly agrees with what is observed at the present moment at Hamburg."

"This looseness of the bowels may be accompanied with some degree of pain, which, however, is generally slight; but in many cases pain is wholly absent; and for some hours, or even days, this bowel complaint may be so slight as to appear trifling; so that, without a previous knowledge of the importance of the warning, it might easily escape notice altogether."

"It must be repeated, however, that when Asiatic cholera is epidemic, the slightest degree of looseness of the bowels ought to be regarded and treated as the commencement of the disease; which, at this stage, is capable of being arrested by simple means, but if neglected only for a few hours, may suddenly assume a fatal form."

They recommend that "each member of the visiting committee in the districts or wards be provided with proper remedies, prepared in appropriate doses for administration on the spot, in every instance in which the premonitory symptom is found to exist."

They state that authorities agree that the looseness of the bowels premonitory to cholera, should be treated in a similar manner with ordinary diarrhœa—opiates, absorbents and aromatics are resorted to, as a table spoonful of chalk mixture with eight or ten drops of laudanum; ten grains of the compound powder of chalk with opium, which is equivalent to it, or twenty grains of confection of opium, which contains about half a grain of that drug, for a dose every two or three hours, and if severe, tincture of catechu may be added in half drachm doses. The camphor mixture, consisting of camphor water, lavender compound, and sugar, with a few drops of laudanum in each dose, will be equally efficacious.

"It is recommended to repeat these remedies night and morning for some days after the looseness of the bowels has been stopped, but in all cases, whenever practicable, that even in this earliest stage of the disorder recourse should be had to medical advice."

These views are fully corroborated and seconded by the advices from Constantinople, of a physician who has had large experience in the treatment of cholera, and witnessed the disease in all its degrees of progress. He states that there is hardly an instance, that came under his observation, of an attack of cholera, *not* preceded by a diarrhœa of

some type,—sometimes so slight as to escape the observation of the patient. Nor had he known of a case where this premonitory symptom had been attended to, that had progressed to the malignant stage of the disease.

The circular of the British Board of Health before alluded to, lays great stress on the importance of a constant watchfulness over the diet and clothing during the prevalence of a cholera atmosphere. "Whenever Asiatic cholera is epidemic, there is invariably found among great numbers of the inhabitants an extraordinary tendency to irritation of the bowels; and this fact suggests that every article of food which is known to favor a relaxed state of the bowels, should, as far as possible be avoided,—such as every variety of green vegetables, as cabbage, cucumbers, salad &c." A safe plan is for each to revert to his own experience, and refrain from whatever has caused gastric and intestinal irritation, and as a general rule avoid articles having much indigestible vegetable fibre, as beans, celery, &c. Fresh meats are better than salted, and in fact the ready digestibility of the diet, is the best criterion to follow in selecting it. Sudden and wide departures from either the quantity or quality of the usual diet are however to be deprecated, as such changes are more likely to bring on a derangement of the alimentary canal, than a gradual accommodation of the diet to the prescribed regimen. This attention should be constant—a single act of indiscretion may place the subject beyond the reach of physic. We well recollect an instance of this during the last cholera season in this city, a carrier, or barrow-man attached to one of the hospitals, whose duty it was to bring the patients to the establishment on the portable bed, then used for the purpose. This individual also had partial charge of the green house where the dead were placed previous to their burial. Having obtained leave of absence from Saturday until Monday, he took advantage of Sunday to have an old-fashioned dinner of bacon and cabbage. The next day found him a patient, and soon after he was an occupant of the dreary apartment he had superintended—a sacrifice to his temerity. Whilst this attention to the quality of the diet is so strongly recommended, there should not be any attempt at fasting. "The intervals between the meals should be regular, and not too long; cholera being uniformly found to prevail with extraordinary intensity, among the classes that observe the protracted fasts common in Eastern and some European countries."

"On account of the intimate connection between the external skin and internal lining membrane of the bowels, warm clothing is of great importance. The wearing of flannel next to the skin is therefore advisable," and any course preventive of sudden checks to perspiration should be observed. During the prevalence of cholera—especially in

warm weather one of the causes predisposing to disease is fatigue. Over exertion of any kind should be avoided—especially if there is any tendency to diarrhœa—whether it be mental or physical—calmness of mind, based on a sense of having attended to all the precautionary measures is altogether favorable to preventing an attack.

The use of cold cathartic medicines of a saline character, as epsom and glauber salts should be avoided, and drastic purgatives—the use of which in this country in the form of the legion of quack pills, which are taken almost as regularly as food, by many—should be especially shunned.

"If, notwithstanding these precautionary measures, a person is seized suddenly with cold, giddiness, nausea, vomiting, and cramps, under circumstances in which instant medical assistance cannot be procured, the concurrent testimony of the most experienced medical authority shows that the proper course is, to get as soon as possible into a warm bed; to apply warmth by means of heated flannels, or bottles of hot water, or bags of heated chamomile flowers, sand, bran or salt; to the feet, and along the spine; to have the extremities diligently rubbed; to apply a large poultice of mustard and vinegar over the region of the stomach, keeping it on 15 or 20 minutes; and to take every half hour a teaspoonful of sal volatile (aromatic, spt. hartshorn) a dessert spoonful of brandy in a little hot water, or a wine glass full of wine whey, made by pouring a wine glassful of sherry into a tumbler of hot milk—in a word, to do every thing practicable to procure a warm general perspiration, until the arrival of the medical attendant,—whose immediate care under such circumstances is indispensable."

In conclusion, we would observe that more may be accomplished by exciting individual attention to the general facts, and inducing each to guard his own conduct, and advise his neighbors when able, than by any other course, and whilst our Boards of Health and special sanitary officers may be using their endeavours to correct those conditions favourable to the virulence of the disease, each member of the community should conscientiously assume his part by a careful attention to these recommendations, which are founded on a fearful amount of past experience.

New Work on Practical Pharmacy.—We take pleasure in announcing that the new work of Mohr & Redwood is in press, and will be published by Messrs. Lea & Blanchard as soon as the execution of the numerous illustrations will admit. We have no hesitation in saying that it will be an extremely valuable addition to the pharmaceutical literature of this country.

THE

AMERICAN JOURNAL OF PHARMACY.

APRIL, 1849.

ART. XXIV.—HISTORY AND ANALYSIS OF A BARK USED ON THE COAST OF AFRICA, FOR THE DETECTION OF WITCHES.

By C. A. Santos.

Through the kindness of Moses Sheppard, Esq. of Baltimore, the writer was presented with a parcel of this bark, and on account of its interesting nature, and the attention it has received from missionaries and others on the coast of Africa, it was presumed that the present paper would be interesting, and consequently has been prepared.

It is said that when a person is charged with witchcraft, he is compelled to drink a decoction of the bark; if death ensues, proof of guilt is afforded; if, however, he recovers from its effects, he is considered innocent.

Its application does not end here, but unhappily, it furnishes a means of gratifying private revenge, and numerous are the cases in which an enemy is accused of sorcery, and the administration of the fatal draught terminates his existence.

In a number of the published communications and private journals of the missionaries, and other writers in Africa, the use of this Saucy Bark or Gidu is denounced as

a great moral evil, and many instances of its fatal effects narrated.

The bark is in pieces which are concavo-convex, from four to eight inches in length, and half an inch in thickness. It has an astringent taste, and is devoid of odour. It has the sp. gr. of 1.054. It consists of the bark proper, and epidermis. The latter is of a dull red colour, and is characterized by large veins, deep fissures, and abundant whitish, warty excrescences.

On breaking transversely, and examining the bark, it is found to consist of longitudinal and perfectly cylindrical fibres, closely compressed, and somewhat lighter in colour than the portion encompassing them.

The part directly beneath the epidermis has a reddish hue, which gradually becomes less deep, until it is blended with the fawn-colored portion near the under surface.

The powder, when snuffed up the nostrils, produces violent sneezing, accompanied with much distress about the head and great contraction of the pupils.

No detailed and accurate account of its effects on the human economy has as yet come under the observation of the writer, but it is said to produce vomiting, redness and glazing of the eyes, and loss of the power of contracting the muscles throughout the body, so that, when the poison has fairly commenced its action on the system, the sufferer is incapable of standing or walking, and the head rolls heavily about the breast and shoulders.

On inferior animals, a decoction of the Saucy Bark caused alternate dilation and contraction of the pupils, appearance of delirium, violent retching, vomiting, symptoms of tetanus, and finally, death.

Chemical Examination.

An infusion was prepared from the contused bark, which, when filtered was clear and of a red colour. With a solution of gelatin, tannic acid was indicated. The presence

of tannin was further confirmed by the sesquichloride of iron. The precipitate thus occurring is of a greenish-black colour, and is consequently identical with that existing in the tea-plant, kino, &c.

Sub-acetate of lead precipitates gum in great abundance. Nitrate of silver and proto-chloride of tin also precipitate the infusion, the former of a dark brown, the latter of a dirty white colour.

Tincture of iodine did not evidence the presence of starch.

Water added to a tincture, prepared with strong alcohol, precipitates resin in quantity.

A reddish, resinous and brittle extract is obtained by the evaporation of the tincture.

The bark was treated with sulphuric ether, and the dark red tincture permitted to evaporate spontaneously, in order to ascertain the presence of fixed oil, but the dryness of the extract and entire freedom from greasiness afforded contrary evidence.

The ethereal extract was acted upon by alcohol, and, apparently a perfect solution obtained, but after filtration, a green substance remained on the filter. This was found to be insipid and destitute of odour, insoluble in water, but soluble in alcohol and ether. The solutions in the last mentioned menstrua are precipitated by water, which facts, in connection with the foregoing properties, cause it to be regarded as chlorophylle.

In the alcoholic solution of chlorophylle, a small amount of a white matter was observed deposited. On boiling, it was re-dissolved, and when the temperature had become reduced, was again thrown down. The quantity was so small that it could not readily be further experimented with, but is presumed to have been wax.

The bark was subjected to distillation, without obtaining volatile oil, or any indication of its existence.

A clear lixivium was prepared from the ashes of the

bark. In this potassa was recognized by tartaric acid and chloride of platinum.

Soda was evidenced by the deposition of the antimoniate of soda on the addition of a solution of the antimoniate of potassa.

Lime was indicated by the oxalate of ammonia.

Iron by the ferrocyanuret of potassium.

Finally, magnesia was tested for by adding a solution of phosphate of soda, and, on subsequently dropping in water of ammonia, a crystalline precipitate consisting of the phosphate of magnesia and ammonia subsided.

With a view of isolating the principle giving activity to this bark, an ounce and a half was boiled with water, acidulated with sulphuric acid, and to the filtered liquid water of ammonia was added.

The purple deposit was washed, dried and mixed with animal charcoal, and in this state treated with boiling alcohol. On evaporating the alcoholic solution, a small amount of acicular crystals were obtained.

Again, the bark was exhausted by displacement with alcohol, and evaporated till reduced to a syrupy consistence.

Quicklime was now intimately mixed with it, and the whole permitted to remain on the sand-bath until perfectly dry. The powder was then boiled with alcohol, and the residue after the evaporation of the spirit was a few grains of a crystalline matter, having a white colour and nauseating taste.

The minute amount of the products of these experiments did not admit of a satisfactory examination of their nature, but were proved to be poisonous by the effects following their administration to animals.

The principle upon which M. Lebourdais has recently separated alkaloids from crude substances was now employed.

Some washed and pure animal charcoal was packed in

a displacer, and a diluted tincture of the Saucy Bark passed slowly through.

The charcoal was afterwards washed, dried, and boiled with absolute alcohol.

Evaporation revealed a crystalline matter associated with resin, a spirituous solution of this substance did not effect litmus or turmeric paper. It was found to be deleterious to life, and its effects on the animal economy were similar to those produced by the Gidu.

The want of material prevented further research, and it is a subject of regret that the writer was not in possession of a quantity of bark sufficient to have allowed a more complete analysis, and especially to have ascertained the nature of the principle which has been so destructive to human life.

In conclusion it may be stated that the kernel of the fruit* of the Cubera Tanghin,† a tree growing in Madagascar, on the eastern coast of Africa, is employed in that island for the same purpose as the Saucy Bark is on the western coast.

Its activity as a poison is very extreme, as one kernel though containing less than a cubic inch of substance, is capable of destroying more than twenty persons.

Moreover, the symptoms preceding and occurring at death are similar to those produced by the bark.

From these facts there is great probability that the trees producing the several articles are allied.

At present, however, there is no certainty, but it is left to the decision which will be the result of more mature knowledge.

* Analysed by Henry & Olivier—Journal De Pharmacie, t. x. p. 49.

† Curtis' Bot. Mag., vol. iv. tabula 2968.

REVIEW.

ART. XXV.—CHEMICAL AND PHARMACEUTIC MANIPULATIONS; A Manual of the Mechanical and Chemico-Mechanical Operations of the Laboratory, containing a complete description of the most approved apparatus, with instructions as to their application and management, both in manufacturing processes and in the more exact details of analysis and accurate research. For the use of Chemists, Druggists, Teachers and Students. By CAMPBELL MORFIT, Practical and Analytic Chemist, author of Applied Chemistry, &c.; assisted by ALEXANDER MUCKLE, Chemical Assistant in Professor Booth's Laboratory. With 423 engravings. Philadelphia, Lindsey & Blakiston, 1849.

THE improvements which have taken place in the practice of Pharmacy in the United States, and more especially in the city of Philadelphia since the establishment of the Philadelphia College of Pharmacy, is a subject of just pride for those who founded that association and have witnessed its steady prosperity. The school of Pharmacy which it formed, was fortunate in securing the services of two accomplished teachers, Drs. Wood and Bache, and we cannot point to any scientific work written by native Americans, which placed us so entirely, by a simple effort, on the level of the best European information, and made accessible to the American public all the best lights of modern science in its particular department, as the Dispensatory of the United States. It was not a crude collection of raw materials, but a well digested compend of all that was to be known on the subject, so completely assimilated to the end in view, as to be entitled to the praise of great ability, and even originality. The publication of that great work forms an era in the history of the profession of Pharmacy in America; and the College under whose auspices it was pre-

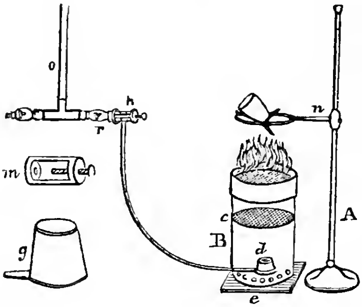
pared, may well take pride in its widely spread and increasing reputation.

A thorough chemical and pharmaceutical education is now essential to the successful and reputable management of an apothecary's shop and drug store, and the desire for the best scientific aid in his profession is felt by every ingenuous youth who applies himself to the business. The work, the title of which is prefixed to this article, is one that ought to be in the hands of every such student of Pharmacy and Chemistry, and contains a variety and amount of information for which he will seek in vain, in the professed Treatises on Chemistry. The author has had in his mind the admirable treatise of Professor Faraday on chemical manipulation, and has given in a condensed form nearly all that is valuable for ordinary use in that work, besides much original matter of his own, and much collected from other sources; all which he has rendered far more useful and intelligible by the aid of excellent figures. We cannot better praise the book or more effectually recommend it to the notice of our readers, than by selecting a few passages more particularly connected with our profession.

Gas Furnaces.

"When coal gas can be commanded, it is far more convenient and economical, and by a particular arrangement may be made to yield heat enough for evaporation and ebullition in capsules, and the different operations of digesting in bell glasses, &c. By the use of a large Argand burner fixed over the jet of the table blow-pipe, Fig. 5, we can obtain the power of a blast. The admixture of the gas, in this way, with atmospheric air, increases the heat to such an extent as to allow the ignition of precipitates in crucibles, and the almost entire dispensation of FURNACE fires in table operations. The arrangement by which these results are accomplished, so as to avoid entirely the deposition of carbon on the bottoms of the vessels, is shown by Fig. 3. *B* is a

Fig. 3.



cylinder of sheet copper, stretched over the top of which, and fastened by an iron hoop, is a fine wire gauze, covered with fine gravel to protect it from wear and tear. In order to promote a more thorough admixture of the gas and atmospheric air, (which is affected in the chimney,) there is a coarse wire gauze diaphragm *c*. The gas pipe of flexible lead depending from, and connected by a gallows screw *h*, with the permanent hanger *o*, terminates in an Argand burner *d*. To prevent a scorching of the table, the burner and cylinder both rest upon a fluted plaster tile. The air enters through the openings in the lower circumference, being drawn up by the upward current of gas, which is let on and regulated by the stop-cock *r*; and the mixture thus formed passing through the upper fine wire gauze, above which it is ignited, should burn with a bluish flame.

"Where the quantity of gas is too great for the amount of air admitted, the flame will be white and smoky, but by regulating the supply of gas, the due proportion for a blue flame will be easily attained. Now, to attain a blue flame from a cylinder of large diameter, a considerable quantity of gas will be requisite, and hence an economical advantage s gained by employing cylinders of different diameters. In the same cylinder, also, where different quantities of heat are desired, the lower series of holes may be made large, and a ring of sheet-iron slid over them, by which the quantity of air admitted or regulated according to the quantity of gas consumed. The cylinders may be 2½ to 5 inches diameter by 6—8 inches in height; but by introducing several pieces of coarse gauze, *c*, at short distances apart, the height

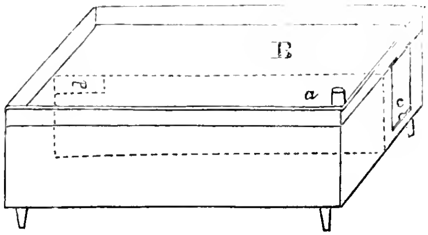
may be diminished. The highest amount of heat produced by this apparatus is a cherry-red by daylight. For burning off filters in a platinum crucible, a cylinder of 2½ inches diameter is amply sufficient; but for heating larger vessels, such as capsules, those of 4—5 inches diameter are desirable. This mode of burning the gas presents the advantages of producing any degree of heat as high as a red, of not blackening vessels immersed in the flame, and of avoiding, with more certainty, the fracture of porcelain or glass vessels, from the diffusive character of the flame."

"The ring *n*, sliding upon the rod of the upright stand *A*, serves as a support for a retort, capsule or crucible. A second chimney *g* placed over the crucible creates a uniform and constant draught.

"The whole of this apparatus is movable, and when the space which it occupies upon the table is required for other purposes, it is only necessary to disconnect it from the hanger, and place the whole aside, to be as readily replaced again when wanted.

"The introduction of gas into the room also allows the substitution of an economical table sand-bath (Fig. 4,) for the more cumbersome one described at pp. 30, 31. It con-

Fig. 4.

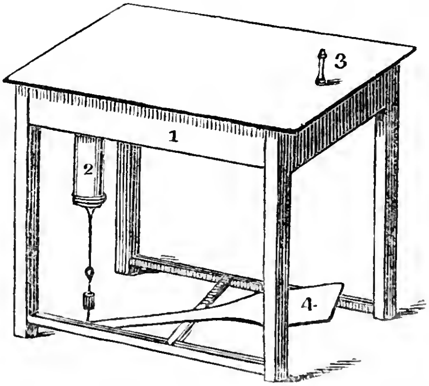


sists of a copper box B eighteen inches long, twelve inches wide and six inches deep. The top, which is ledged, projects over about an inch and forms the bed for the sand. The

door *c* having a small semicircular opening at its base, is for the entrance of the gas pipe with an argand burner attached, as well also for the supply of air necessary to sustain combustion. The fire thus applied heats the sand on the top. The heated air has an exit through the circular aperture *a*, after having traversed the interior, which is divided lengthwise by the partition as represented by the dotted lines. The communication between the apartments is by an opening *d* in the diaphragm. In this way we obtain a graduation of the temperature of the bath. The Swedish chemists improve upon this construction, by annexing an apartment for drying filters and precipitates as well as for keeping liquids hot while filtering.

"The blast or pneumatic table is an implement indispensible to the chemist it being alike useful for bending glass tubes, blowing bulbs and other small apparatus, and for rapidly effecting the decomposition and ignition of substances, which, for their fusion, would require an ordinary wind furnace. The most convenient form of this apparatus is shown by Fig.

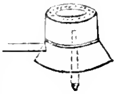
Fig. 5.



5. The drawing is taken from one, in Professor Booth's laboratory, made by J. Bishop, machinist of this city. It consists

of a brass cylinder piston 2, worked by a treadle which drives the air into a large tin box enclosed in a frame-work 1 immediately under the top of the table. From the front end of the box a tube rises through the table top, and terminating with its small jet within the interior of an Argand burner, urges the air directly upwards, producing a full flame. The Argand burner may be connected with a lamp or reservoir, containing a solution of oil of turpentine, or alcohol, or with a gas pipe. In the former case, the burner has a circular wick with a contrivance for adjusting its height. The latter, being neater, and always ready, is almost exclusively used in the laboratory, as giving a powerful flame which may be elevated or depressed at pleasure. With one of the new fashioned Argand gas burners as shown by Fig. 6, this table forms an excellent substitute for ordinary furnace operations.—(*Encyclopædia of Chemistry.*)

Fig. 6.

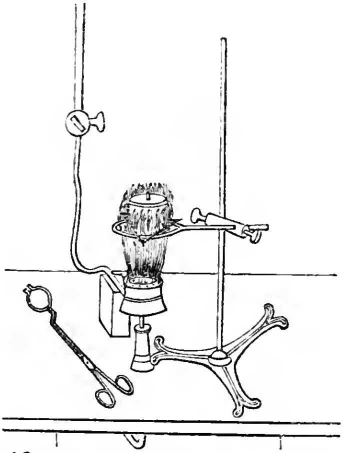


"*The Table Blow Pipe.*—"This table may be used either with a Berzelius or Rose lamp, or the Argand *gas* burner. Gas, when furnished by public companies, is by far the most economical source of heat, and withal is powerful, readily manageable, and cleanly. For all the nicer ignitions, fluxions, and fusions it does away with the necessity of a furnace, which is less convenient, and requires tenfold the time for its action. In five minutes by the use of this implement, we can often satisfactorily complete processes which with a furnace would require an hour. This saving of time and fatigue is an important consideration when the operations are to be multiplied or rapidly repeated. It is applicable to all the purposes of ignition, fusion, and fluxion of limited quantities of matter, and by 'driving the current of air obliquely and somewhat downward through the Argand burner, the process of cupellation may be accurately performed on three hundred grains of lead.'"

"When gas is used it is only necessary to bring the Argand

burner, Fig. 6, over the jet 3, Fig. 5, and to depress it so

Fg. 7.



much that its orifice may extend a short way into the flame for heating a vessel of small surface, and still further for vessels of greater superficies. The gas being turned on and inflamed, the treadle is then worked with the foot, slowly at first, until the current of air thus forced up through the tube changes the white and quiet flame into one of a pale reddish tint and ragged outline. If too much air be driven through, the flame becomes bluish, and the heat becomes less intense.

Desiccation of Solids.

"Those saline matters which readily yield all their water by exposure may be reduced to powder or *effloresced* by subjecting them in thin layers to a draught of dry air which, if necessary, may be moderately heated. For this purpose as well as for that of drying crystals which do not effloresce, it is necessary in manufacturing laboratories to have a special apartment. This room should be smoothly plastered within, and need not be of large size. As a means of ventilation its opposite sides are pierced with small holes, which, to prevent the admission of dirt, are covered with

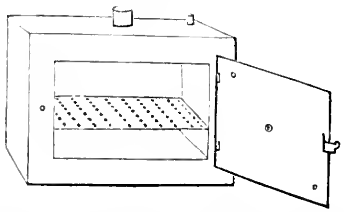
wire gauze. The interior is fitted with trellis shelves for the support of the wooden frames, stretched over with white muslin, and upon which the substance rests between or upon, as may be required, folds of bibulous white paper. The heat is communicated by sheet iron flues proceeding from a stove placed outside of the enclosure, or by means of steam pipes fed by the generator. The temperatures should range from 75 to 100° F.

This apartment is also useful for pharmaceutical purposes, for drying plants, roots, seeds, woods, &c. They may either be suspended or spread in thin layers upon frames, and repeatedly turned for the purpose of exposing fresh surfaces.

The air chamber of the furnace may, to a limited extent, be made to replace this apartment, and in an experimental laboratory it is, together with the means mentioned in this chapter, sufficient for all purposes.

As the salts effloresced as above still retain a little water, they require to be repeatedly pressed between the folds of white paper until dampness ceases to be imparted to them, Sometimes a previous trituration is necessary to facilitate the process.

Fig. 8.



Filters containing precipitates, after careful removal from the funnel and compression between the folds of bibulous paper, may be further dried in the same manner. Those, however, which contain the results of analytic experiments require more careful manipulation. For their treatment a copper-plate oven is often used. It consists (Fig. 8) of a

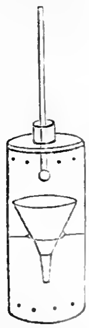
brass soldered copper box 7×9 inches, enveloped by a steam-tight jacket, in the door of which are vent holes for change of air. The water, or the olive oil which is used if the substance requires a heat higher than 212° for its desiccation, is poured through the centre aperture at the top, but must not more than half fill the jacket. The lateral opening is for the reception of a thermometer, which is adjusted by means of a perforated cork, for facilitating the regulation of the temperatures.

The watch glasses, plates, or capsules in which the substances to be dried are placed, rest upon the perforated shelves in the interior.

The thermometer will indicate with precision the temperature of the bath, and care must be taken that the latter be not allowed to exceed the degree above which the body to be dried decomposes.

When for any reason it is deemed inadvisable to remove the filter from the funnel, they may both be dried together in a hot air oven, Fig. 9. The apparatus shown in the cut is a copper double or single cased cylinder, with a movable cover, to facilitate the introduction of the substances to be dried. In its centre is a circular aperture for the reception of the thermometer by which the heat is regulated. A perforated diaphragm serves as a support for the funnels, watch-glasses, capsules or other vessels, and in order to promote the evaporation, a current of air through the interior is excited by means of the circular apertures in its upper and lower circumference.

Fig. 9.



These baths are all heated over small furnaces or preferably over the gas lamp, a uniform heat being maintained by careful management of the flame.

These extracts are fair specimens of the minute accuracy with which our author enters into details. He treats of the various operations of the laboratory under distinct heads, and enters fully into the most important particulars of each.

A very curious and interesting chapter is devoted to the application of the polarisation of light to the discovery of the strength of saccharine liquids. There is not a more beautiful example of the value of the most recondite and refined discoveries in science to the practical working man, than is furnished by this application.

The following chapter possesses interest for the general student and we give it entire.

Construction of Formulæ.

All compounds are either mechanical mixtures following no precise law, or consist of simpler bodies united in definite proportions agreeably to the laws of chemical attraction. The latter may be represented by formulæ.

There are many advantages attending the employment of formulæ, and nothing has tended to advance the science of chemistry further and more rapidly than their use. They convey to the eye, like pictures, a far clearer view of the nature of a compound than the most laboured description could effect. While they are established by analysis, their reaction tends to confirm or disprove its results. As they are pictorial representations, the memory may retain the composition of thousands of compounds, and yet not be overburthened. Isomorphous bases may be thrown together under a short and general expression, and thus substances, often differing widely in external properties, are brought into natural groups, a result to which the analysis of a body would never lead without the formula.

When a definite compound has been separated by analysis into its constituent parts, their relative proportion is generally expressed in per centages, but such a mode of expression does not convey a clear idea of the chemical nature of the body, as compared with other compounds, containing the same or allied constituents. The per centage composition is usually given as simply expressing the results of analysis. To ascertain the nature of the union among the constituents,

agreeably to the received laws of affinity, they must be reduced from their per centage proportion to the proportions of their equivalents. If any one of the constituents happens to express in the per centage results, the combining weight of that body, the others will also express their combining weights or multiples of them. Or if any one can be multiplied or divided by any number, which will give the combining weight of that body, the others multiplied or divided by the same number, (in order to keep up the same proportion as in the per centage results,) will express their combining weight or multiples of them.

"Thus the analysis of carbonate of lime, according to Dumas (1,) and Erdman and Marchand (2,) gives—

	1	2	÷2
Lime	56.06	56	28
Carbonic acid	43.94	44	22
	100.00	100	50

"If the 44 carbonic acid be divided by 2, it gives the combining weight of one equiv. of the acid; and the lime if divided also by 2, gives the combining weight of one equiv. of it. It is, therefore, composed of 1 equiv. of each constituent. Again, if 56 be divided by the combining weight of lime, 28, the result is 2; and 44 divided by the combining weight of the acid, likewise gives 2. The proportion between the equivs. is, therefore 2 : 2, or reduced to the lowest term 1 : 1.

"Now since the per centage composition expresses the proportion between the combining weights of the constituents, if each constituent be divided by its combining weight, the result will be the proportion between the number of equivalents in the compound.

"Then the lowest of these numbers divided by itself gives unity; and the others divided by the same number will express the proportion between all the equivalents, and generally in whole numbers, if the analysis has been correct.

Thus the analysis of blue vitriol, by Berzelius gives the following numbers in the 1st column, expressed in 100 parts.

Oxide of copper	32.13	0.803	1.018	1
Sulphuric acid	31.57	0.789	1.000	1
Water	36.30	4.0333	5.111	5

"The constituents being severally divided by their combining weights, the numbers in the 2d column result; and by dividing each of these by 0.789, we get the 3d column, which, by making a slight allowance for the imperfections of analysis, gives the proportions between the equivalents 1 : 1 : 5.

"Having determined the number of equivalents, a formula is easily established, which in the case of carbonate of lime is CaO,CO_2, and of blue vitriol CuO,SO_3+5HO. Now the per centage composition of dry or anhydrous sulphate of copper is 50 oxide of copper and 50 sulphuric acid. If we compare it with the per centage composition of blue vitriol, the relation between them is not readily seen; and in the case of many other substances, no relation whatever can be detected; but if the formulæ deduced from each analysis be compared, their relation is at once evident, for we perceive that the blue vitriol contains 5 equivalents of water, which the other does not, and that otherwise they are one and the same substance.

"The silicates form a numerous class of crystallized minerals, whose formula may be established by the foregoing method, or by determining the quantity of oxygen in each element, and bringing these quantities into whole numbers, those of the isomorphic bases being added together. It is, perhaps, a more convenient method for these bodies than the preceding.

The construction of the formula for an organic body depends on precisely the same principles, and is ascertained by a similar process; but there is a peculiarity in the formula of organic bodies, which is rarely met with in mineral

substances. Thus the analysis of olefiant gas gives as its formula CH; but from its density and other circumstances it should be C_2H_2 or C_4H_4. The formula deduced from the analysis of sugar is CHO, but it decomposes into alcohol and carbonic acid, and, therefore, either $C_2H_3O+CO_2=C_3H_3O_3$ ought to be the formula, or $C_6H_6O_6$ or $C_{12}H_{12}O_{12}$, which last, indeed, is most generally received. A formula may also be doubled or trebled, if viewed as a bibasic or tribasic acid. Therefore, after determining the simplest formula for an organic body, its more rational formula is determined by the specific gravity of its vapour, by its mode of combining with bases or acids, or by its metamorphoses."

Our limits forbid us from making further extracts. Those which we have given will we hope induce our readers to possess themselves of the book which should be the *vade mecum* of the chemical student.

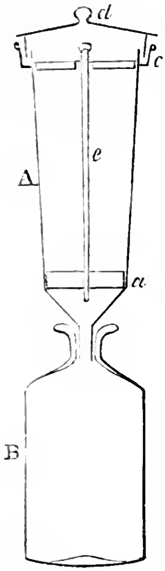
ART. XXVI.—REMARKS ON OLEO-RESINOUS ETHEREAL EXTRACTS, THEIR PREPARATION, AND THE ADVANTAGES THEY OFFER TO THE MEDICAL PRACTITIONER.

By William Procter, Jr.

Quite a number of drugs owe their medicinal activity and value to the existence among their constituents of a resin and volatile oil, and these frequently exist in such quantity as to yield fluid, or semi-fluid extracts when the ethereal tinctures of the drugs are evaporated. Cubebs Black Pepper, Cardamoms, Ginger, Worm-seed and Pellatory are among these. In volume 18, page 167 of this Journal, the writer published an essay on "the Ethereal Extract of Cubebs," a preparation which has since met, to a

considerable extent, the approval of physicians, and it represents, so completely, the medicinal power of the drug, that nothing is left to be desired.

Fig 10.



The simplest means of preparing these extracts is to place the substance to be extracted, in powder, in a tin displacer, such as Fig 10, allowing sulphuric ether to percolate slowly through it until the tincture that has passed equals twice the weight of the substance, when much soluble matter is yielded, as is the case with cubebs, or only once the weight of the substance if the extract is small, as in the instance of ginger. The tincture may now be evaporated spontaneously to obtain the extract, in which case the ether is lost, or it may be introduced into a distillatory apparatus heated by a water bath at 120 degrees, until seven-eighths of the ether is regained, when the residue by exposure in a capsule loses the remains of the ether, and is ready for use.

The ethereal extract of black pepper deposits a considerable amount of piperin by standing, which may be removed, as the active properties of the pepper reside in the fluid oleo-resin.

The ethereal extract of cubebs, by long standing, especially in cold weather, will deposit crystals of cubebin and a waxy matter. The latter is of no value, and the former may be easily redissolved by gently heating the extract, by dipping the bottle containing it in warm water, occasionally agitating it.

The ethereal extract of capsicum is a dark reddish brown liquid, having the same consistence as that of cubebs, and an intensely pungent, burning taste. This extract has, so far as I am acquainted, never been applied in medicine. It may advantageously be used for internal administration,

precisely in the manner that the so-called oil of black pepper is used, which is an analagous preparation. For external use, as a rubefacient either *per se*, or admixed with other substances, it would present several advantages.

The ethereal extracts of chenopodium and *semen contra*, are undoubtedly worthy of attention; they have a semi-fluid butyraceous consistence consisting of volatile oil, resin, and chlorophylle, and that of semen contra contains santanin also.

The ethereal extract of ginger is already known in French Pharmacy under the name of *piperoid* of ginger, and was proposed by M. Beral as the basis of several preparations of the drug.

The ethereal extract of cardamom seeds is well deserving of attention. These seeds contain about 10 per cent of a fluid fixed oil, and 4.6 per cent of volatile oil, the latter being the desirable portion. The pure volatile oil soon changes by exposure to the air, and loses its fragrance; but when mixed with the fixed oil it is much more permanent, and may be applied in various ways as an aromatic, to powders, to emulsions, and probably would afford a good substitute for the powdered cardamom (which is rarely sufficiently fine,) for introduction into the extract of colocynth.

The ethereal extract of pellatory (Anthemis pyrethrum) is semi-fluid, or almost fluid, and possesses the curative properties of the drug in a very condensed form. It is an admirable application for paralyzing or numbing the dental nerves in decayed teeth—and is more manageable than the alcoholic extract, which has been used in this city.

With the permission of the publishers, I have annexed hereto, the description of an apparatus for extracting with ether, suggested by Dr. Mohr, one of the authors of Mohr & Redwood's Practical Pharmacy, from which work it is taken.

"Figs. 11, 12, and 13 represent this apparatus, which consists of a two-necked Woulf's bottle, (fig. 11, *P*,) into the cen-

tral mouth of which the metallic vessel (R, fig. 12) is fitted by means of a cork.

The vessel R consists of a metallic cylinder (*a*, figs. 11 and 12,) having a perforated strainer (*k*) near the bottom, and terminating with a funnel-neck, to admit of its being fitted into the Woulf's bottle. This cylinder is surrounded by a second cylinder (*b*,) the space between them being intended to contain either hot or cold water. In the top of the inner cylinder (*a*) a slightly conical vessel (*c*) is made

Fig. 11.

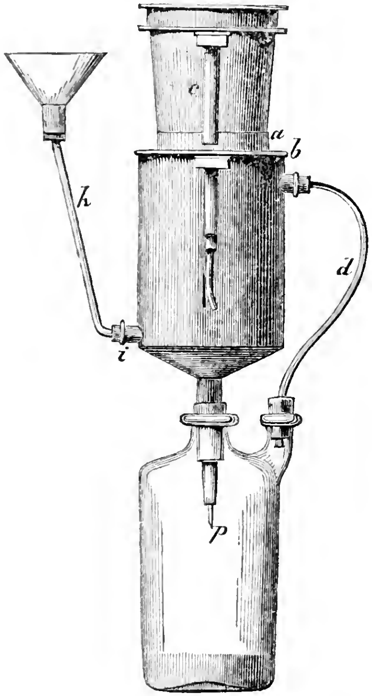
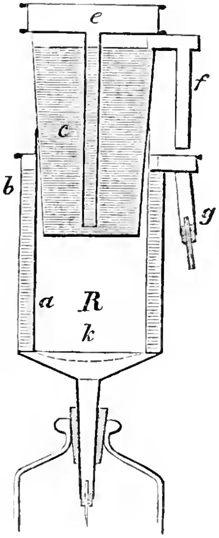


Fig. 12.

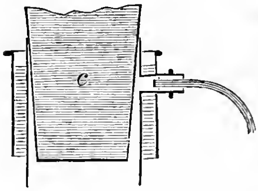


Apparatus for making Ethereal Tinctures.

to fit air-tight, as shown in the drawing. This vessel (*c*) is intended to be used as a condensing apparatus, and for this purpose it is filled with cold water. From the second or

lateral opening of the Woulf's bottle, a glass or tin tube

Fig. 13.



(*d*) is carried to the upper part of the cylinder *a*, where it is inserted, as shown in fig. 13. The cold water in the vessel *c* is renewed through the pipe *e*, which conducts it to the bottom, while the warm water runs off from the top through the pipe *f*. Hot or cold water is renewed to the space between the two cylinders (R,) by the tube-funnel *h*, and the water from this space overflows into *g*, and is carried off together with that from *f*. The tube *h* is inserted through a perforated cork at *i*, so that, by turning the tube downwards, the water from the space between the cylinders can be thus allowed to run off.

The method of operating with this apparatus will now be easily understood. The substance, in coarse powder, is placed upon the perforated strainer in the space marked R, (fig. 12,) over a piece of flannel, cut to the size of the strainer. Ether is now poured over the substance to be operated upon, and allowed to percolate through it and run into the Woulf's bottle. The tube *d* is fixed in its place, and cold water is introduced into the space between the cylinders *a* and *b*, and into the vessel *c*. The bottle is now immersed in hot water, so as to cause the ether which has run into it to boil; and the vapour passing through the tube *d* into the upper part of the vessel R, is condensed there by the action of the surrounding cold water, and again passes in the liquid state through the substance to be exhausted. This circulation of the ether may be continued, without loss, until the solid substance is completely exhausted, which will be indicated by the ether dropping into the bottle colourless.

The extraction is in this way effected very rapidly. The following results were obtained from the treatment of eight ounces of worm-seed with ether. The worm-seed, in coarse

powder, was put iuto the cylinder at R, and eight ounces of ether poured over it. The ether was nearly all absorbed by the powder, and scarcely anything passed into the bottle below: four ounces more of ether was therefore added, when a strongly-coloured solution passed. Heat was now applied, so as to boil and evaporate the ether, and in a few minutes afterwards a deep green liquor began to drop from the cylinder. As the heat was continued and increased the returning liquor increased in quantity, so as to run in a stream, until the perfect exhaustion of the worm-seed was indicated by the return of colourless ether. The apparatus was now taken out of the warm water, and allowed to cool. The cold water was in the next place removed from the space between the cylinders *a* and *b*, by turning down the tube *h*, and the water was also emptied out of the condenser (*c*.) The tube *d* was removed, the neck of the bottle into which this had been inserted being at the same time closed with a cork; while from the opening into the cylinder, where the other end of the tube *d* had been inserted, a tube was fixed connecting it with a Liebig's condenser. Hot water was now poured through the funnel and tube *h* into the space between the cylinders, which, heating and vaporising the ether with which the powder was saturated, caused it to distil over through the condenser. This being completed, the vessel R and its appendages was removed from the Woulf's bottle, and a tube made to connect the mouth of the bottle with the Liebig's condenser; when hot water being again applied to the bottle, the ether distilled off, until a syrupy liquor was left, which was finally evaporated to the consistence of butter in a porcelain dish.

The eight ounces of worm-seed was thus completely exhausted in an hour and a half, with twelve ounces of ether, of which nine ounces was again recovered by distillation, and the resulting extract weighed ten drachms. With greater care in the condensation of the ether, I think another ounce might have been recovered.

This apparatus may also be applied in the process of extraction with spirit; but in this case it is necessary to apply more heat, by using a solution of chloride of calcium or a sand-bath.

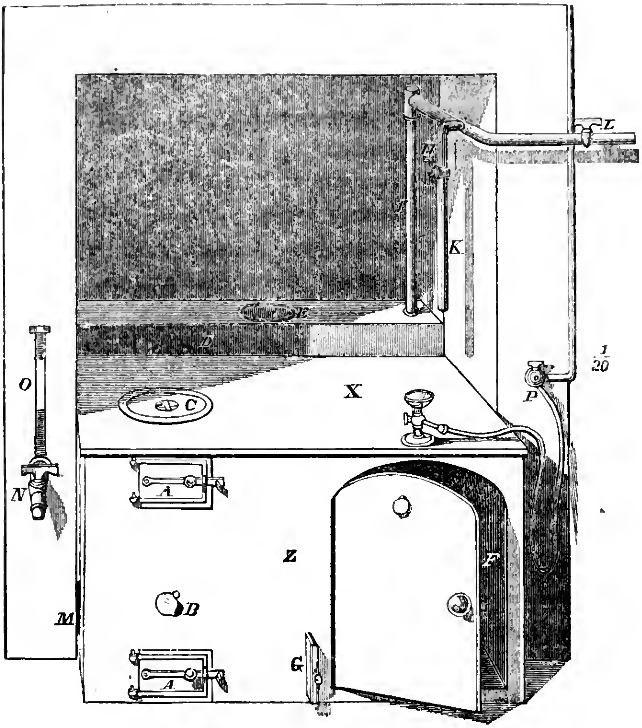
If the principle of this apparatus were carried out on the large scale, and a metallic vessel employed instead of the glass bottle, the exhaustion of sabadilla-seeds, and even of bark, for the preparation of the alkaloids, might, no doubt, be accomplished with the smallest possible loss of alcohol.

ART. XXVII.—PRACTICAL PHARMACY; the arrangements, apparatus, and manipulations of the Pharmaceutical Shop and Laboratory. By FRANCIS MOHR, Ph. D. Assessor Pharmaciæ of the Royal Prussian College of Medicine, Coblentz, and THEOPHILUS REDWOOD, Professor of Chemistry and Pharmacy in the Pharmaceutical Society of Great Britain. American Edition, with numerous additions and over five hundred wood cuts. By WILLIAM PROCTER, Jr., Professor of Pharmacy in the Philadelphia College of Pharmacy. Lea & Blanchard, 1849. pp. 550.

[The want of a treatise on practical pharmacy, devoted to apparatus and manipulations, has long been a dissideratum both in England and the United States; it is therefore with pleasure that we call the attention of our readers to the work of Mohr & Redwood, which has just been issued by Messsrs. Lea & Blanchard. The book has been received too late to give it now the examination it merits, which we promise shall be done in our next number; in lieu, however, we present a few extracts from the work which will give some idea of its character.—EDITORS.]

" Fig 14 represents a useful kind of stove, which may be fixed in the fire place either of the shop, or more conveniently of a room adjoining the shop. it consists of a chemical furnace, drying closet, and boiler for the supply of

Fig. 14.



REDWOOD'S PHARMACEUTICAL STOVE.

A. A. The furnace and ash-pit doors.
B. Circular opening into the fire, for clearing the bars, inserting a tube, &c.
C. Circular opening to the top of the furnace.
D. The boiler.
E. Circular opening into the boiler, with a dished cover, and water-joint. See fig. 15.
F. The drying closet.
G. A sliding door or damper, for opening or closing a communication between the drying closet and ash-pit.
H. The flue from the furnace fire.
I. The steam-pipe
K. L. Two branches from the steam-pipe.
M. Channel for conveying air round the back of the fire into the drying closet.
N. The tap for drawing water from the boiler.
O. Tube for indicating the height of the water in the boiler.
P. Gas pipe, with flexible tube, and burner.
X. Z. Cast iron front and top to furnace.

hot water and steam, with provision for carrying steam or noxious vapours, from any process, up the chimney.

I have arranged this furnace with a view to its being economically and easily constructed. The top plate X, and the front with doors and return ends Z, should be of cast iron, half an inch in thickness. It would be necessary to have patterns made in wood from which to make these castings, but if it be a consideration to construct it at the least possible cost, the front may be made of brick, thus dispensing with the outer cast iron case; and the doors for the furnace, ash-pit, and drying closet, may be bought ready made, at any ironmongers. The drying closet door is such as is commonly used for the oven fixed in kitchen ranges. The boiler D is also kept by most ironmongers. The drawing is made from one of those manufactured by the Carron Company of Thames Street, London; it is three feet six inches in length. The pipes for supplying and drawing off the water, and also the steam-pipes are attached in the usual manner. The supply of water to the boiler may be regulated by a cistern with a ball-cock, similar to those adopted for kitchen ranges, or by a ball or stone float in the boiler itself similar to those used with steam boilers. The former of these plans is perhaps the least expensive, and most easily effected in country places; it is, however, subject to this objection, that in using the steam, a certain amount of pressure is required in the boiler, which will force the water into the supply cistern, and sometimes cause it to overflow there. This result may be obviated by having a stop-cock between the supply cistern and the boiler, so that when pressure is required, this communication may be cut off. In this case, and indeed under any circumstances, it would be desirable to have a glass tube O, for indicating the height of water in the boiler. One end of this tube is inserted into the pipe of the tap N, and the other end communicates by a piece of metallic tube with the upper part of the boiler. The opening E, in the top of the boiler, may have a dashed cover fitting on with a water-joint, as shown

in fig. 15. This would prevent the escape of steam under ordinary circumstances, and would act as a safety-valve by

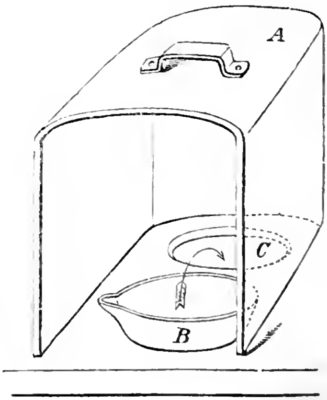
Fig. 15.

allowing it to escape, if unusual pressure were applied, while at the same time it might be used as a water bath for the reception of an evaporating dish. The water joint would be inapplicable, however, if the steam were required to be used under more than a very slight pressure. It would be the most simple and inexpensive way of fitting the boiler, but tight joints and a proper safety-valve would render it more completely and generally useful, and would be necessary for some of the applications we are about to notice. The ash-pit door should be made to fit as close as possible, so that the admission of air here may be shut off at pleasure. The furnace door should be close to the top plate, as shown in the drawing; and there should be a small opening B, immediately over the furnace bars, to admit of the clearing of the bars with a poker, of sending a blast of air into the fire from a bellows or blowing machine, of introducing a tube into the fire, warming a plaster spatula, &c. Between the drying closet and the ash-pit, there is a communication which may be opened or closed by means of the sliding door or damper G, and at M, there is an air-channel passing round the back of the fire and under the boiler to the drying closet. The course of this air-channel is further shown in fig. 16 at F. When the furnace is in action, if the ash-pit door be shut, and the damper G drawn out, the air supplied to the fire will be necessarily drawn from the drying closet, while fresh air, warmed by its proximity to the fire, will at the same time enter the closet through the channel M. A constant current of warm dry air will thus be maintained through the drying closet, which will render it very efficient for the purposes to which it is ap-

plied. The circular opening C, in the top of the furnace, will receive a pan, small still, or other similar vessel. Decoctions may be boiled in flat-bottomed saucepans merely placed on the hot plate over the flue, a little further back than the opening C. The top of the boiler may be used for any process to which it is applicable, requiring the heat of boiling water.

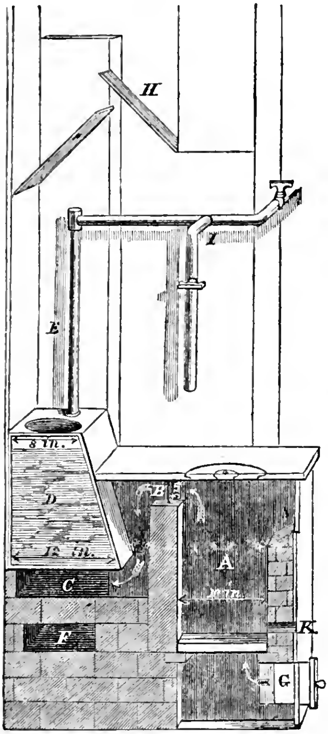
"The iron plate forming the top of the drying closet at X, will have only the slight heat which it acquires by conduction from the fire. Processes involving the liberation of noxious vapours, may be conveniently conducted here, as the vapours will pass up the chimney. The gas-burner and flexible tube, as shown in the drawing, may be required in some processes of this description, as also the gas-furnace (fig. 20,) which is placed over the gas-burner, and forms a support for a dish, flask, or other vessel. In some cases, however, the furnace-hood, (fig. 16,) will be found to form a better arrangement for getting rid of noxious vapours. It is made of tin-plate, and is placed, as represented, on the top of the furnace over the circular opening C, while the vessel from which vapours are disengaged stands a little in front of the opening.

Fig. 16.



"Under these circumstances, the vapours arising from the dish will be drawn into the furnace as indicated by the arrow. If the furnace be well constructed, this effect will be complete; but, should there be any defect in the draught, it may be necessary to close the ash-pit door, in order to insure the desired result.

Fig. 17.



SECTION OF PHARMACEUTICAL STOVE.

A. The fire-place.
B. The flue passing under the top plate of the furnace.
C. The flue passing under the boiler.
D. The boiler.
E. The steam-pipe with the branch I.
F. The air channel leading to the drying closet.
G. The communication between the drying closet and the ash-pit.
H. The chimney plates for preventing the soot from falling on to the furnace

" Fig. 16, represents a section of the pharmaceutical stove, through the fire place and boiler. It shows the arrangement by which steam and other vapours are allowed to pass up the chimney, while the soot is prevented from falling down. This arrangement consists of two plates of iron, fixed as represented at H, one against the back, and the other against the front wall of the chimney.

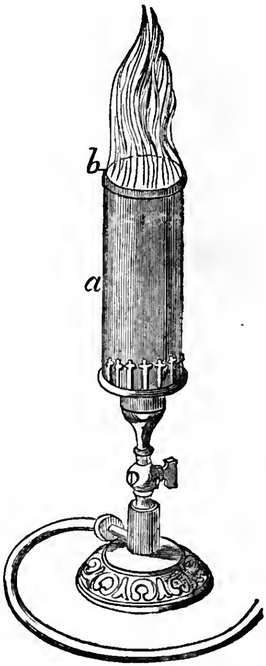
"This pharmaceutical stove will thus admit of many useful applications, even when constructed in the most simple and inexpensive manner, with the water-joint valve. If, however, the joints be all made tight, and a safety-valve, capable of sustaining a pressure of three or four pounds to the inch, be attach- to it, it would be suceptible of still further appliances. The steam generated in the boiler, which cannot be forced through pipes, so as to be fully available for use, unless exposed to some pressure, might, under the arrangements now contemplated, be used for making decoctions, warming a drying closet, supplying distilled water, and

finally for warming the shop. The means of applying it for the three first-named purposes, will be described under the head of Steam Apparatus for the Laboratory."

"*Gas and Alcohol Lamps.*—In the greater number of dispensing establishments the range of operations requiring heat is very limited, and the space for operating confined chiefly to the shop. To these the possession of gas, and alcohol lamps, is invaluable. Where gas is to be had, gas-burners should be used in preference to all other lamps, as safer, more economical, and far more conveniently managed.

"Gas has long been used for heating purposes, but its smokiness was a serious objection to its use until the suggestion of Dr. Duncan, of Edinburgh, was carried into practice. This consists in burning it after admixture with atmospheric air. A wire gauze is stretched across the top of a tinned iron cylinder, into which, at its lower and open end, the gas enters from a jet and mixes with the air as it rises. The mixture is ignited above the gauze and burns with a clear bluish flame. Fig. 18 shows the manner in which this is effected.

Fig. 18.



"The original cylinder of Sir A. Robinson was thirty inches long, but it has been found that six or eight inches is quite long enough; and if several diaphragms of coarser wire gauze be placed at intervals in the cylinder, its length may be decreased to four inches; especially if the gas issues into the cylinder from such a burner as fig. 19.

"The gas-furnace of Mr. Rickets, noticed in Chap. I. is equal to a charcoal fire for many of the purposes of the pharmaceutist, and can be conveniently arranged at the working counter. A set of the shorter cylinders, from one to four inches in diameter, should be at command—made of tinned iron—one end covered with fine brass wire gauze, simply crimped over the edge, and a piece of copper wire twisted around it. When no means of protection are used, the gauze requires to be renewed, if constantly in use, at intervals of one or two months; especially if corrosive substances are allowed to come in contact with it from the boiling over of liquids. It may be protected by having a short cylindrical cap, covered with coarse iron wire gauze, slipped over the end of the cylinder, and the space between the two wire tissues filled with granular pumice-stone, free from dust.

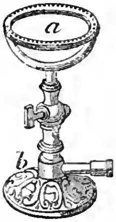
"The following arrangements are adopted in the laboratory of the Pharmaceutical Society, where they were originally introduced.

" *Gas-Burners.*—The gas-burner generally used is that represented in fig. 19. It consists of a perforated ring (*a*) the diameter of which is two inches and three quarters; this is supported on a foot (*b*,) and attached by a flexible tube to the gas-pipe, so that it may be moved to any part of the work-table, to suit the arrangement of other apparatus.

" Fig. 20 represents a larger gas-burner, the diameter of which is six inches, but this is rarely required excepting in some particular cases, in which it may be wished to have the heat diffused over a large surface. The smaller burner affords heat enough to boil a gallon or more of water in a metallic vessel.

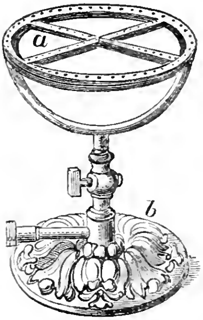
" *Gas-Furnaces.*—The gas-furnace, (fig. 21) is used to confine the heat of the flame from the gas-burner, to protect it from being blown about by currents of air, and at the same time to form a support for the vessel containing the liquid to be heated. This furnace consists of a slightly conical

Fig. 19.



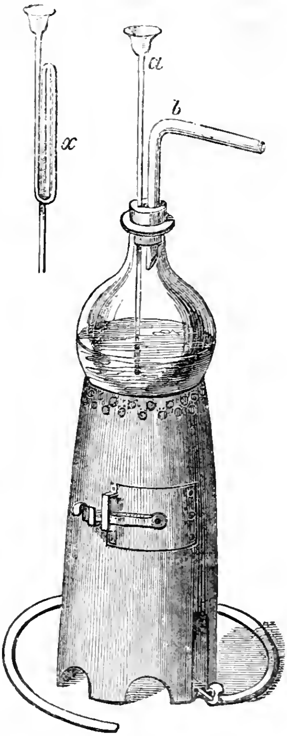
GAS-BURNER.

Fig. 20.



GAS-BURNER.

Fig. 21.



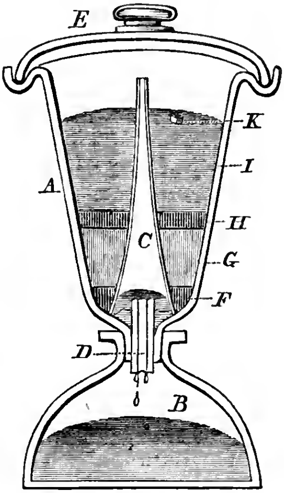
GAS-FURNACE.

cylinder of sheet iron, which is covered with black japan varnish to protect it from becoming corroded with rust. It is four and a half inches in diameter at top, five and a half inches in diameter at the bottom, and ten inches in height. The air for supporting the combustion of the lamp, is admitted through apertures at the bottom of the cylinder, while the hot air and products of combustion, escape through a number of small holes near the top. There is a door on one side of the furnace, which is used for lighting the lamp when any apparatus is fixed over the opening above; there

is also an aperture extending from the bottom upwards to the height of about five inches, through which the flexible gas tube passes, and which admits of the lamp being placed on a block of wood, so as to bring the flame nearer to the top of the furnace when this is desired.

"But, of all the several kinds of apparatus which have been suggested, I have found none so generally convenient and efficient as that represented at fig. 22. This form of apparatus was contrived by Mr. Gilbertson, of Ludgate Hill, by whom it is sold. It consists of a conical vessel (A), with a water-joint rim at the top, into which the cover E fits. A tube (D) is ground to fit into the opening in the bottom, and over the end of this tube is placed a conical tube (C), the lower end of which has several notches cut in it, so that the liquid can pass under it when placed as shown in the drawing. The lower extremity of the vessel A is ground to fit into the mouth of the receiver (B.)

Fig. 22.

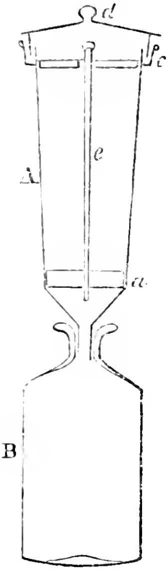


GILBERTSON'S DISPLACEMENT APPARATUS.

In using the apparatus, the cover (E) is removed, and some dry, clean sand is poured into the vessel A, so as to form a layer (F) at the bottom. Over this the solid ingredients to be operated upon (G are carefully packed, and a layer of sand (H) is placed over these. The spirit (I) is then poured over the surface of the sand, care being taken not to disturb the ingredients below. The best method of guarding against the disturbance of the dry ingredients, on pouring the spirits in, is to place a flat cork (K) on the sand, and to direct the stream of liquid on to the cork, which will float on the surface of the liquid when introduced; the force

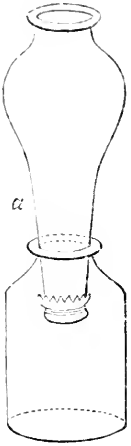
of the current will be thus broken, and the operator enabled to pour in the whole quantity of spirit required, without affecting the position of the solid ingredients. The cover is then to be put on, and a little water poured into the groove, so as to render the joint air-tight. The spirit will percolate slowly through the different strata of dry ingredients until it reaches the bottom, then, passing under the tube C, it will ultimately drop down, through the tube D, into the receiver, while, at the same time, an equal volume of air passes up through the tubes to supply its place in the upper vessel, and equalize the pressure. Thus arranged, the apparatus is perfectly air-tight, so that no loss from evaporation can occur, however long the process may be in operation. The form and size of the apparatus, also, are such as to admit of the solid ingredients being properly packed in the vessel A, upon the skilful performance of which the success of the process principally depends. In most cases it is desirable to use these ingredients in fine powder, and, in some instances, they may be advantageously mixed with coarse sand, which, by separating the particles, will facilitate the percolation of the liquid. If the ingredients be properly packed, the spirit, when first added, will be slowly absorbed by the powder, and will descend equally on every side, forming a line round the circumference of the vessel, which will gradually pass downwards until the tincture begins to flow through the tube D. Some experience and judgment are required in regulating the degree of pressure to be applied in packing the powders, or, if necessary, mixing them with sand, so as to insure a regular and continued percolation; and, as differences in the nature of the substances operated upon, the degree of comminution to which they have been subjected, and the form and size of the apparatus employed, so far influence the results as to occasion the necessity for some modifications in the method of operating, no precise instructions can be given that would be applicable to all cases.

Fig. 23.



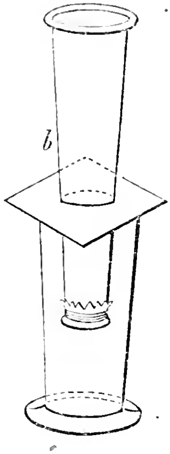
DISPLACER FOR VOLATILE LIQUIDS.

Fig. 24.



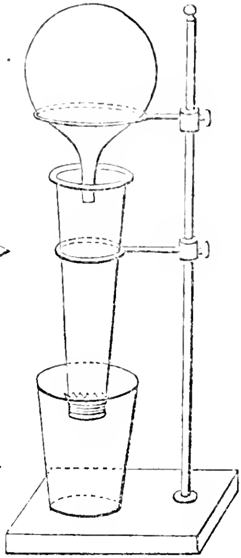
GLASS DISPLACER.

Fig. 25.



GLASS DISPLACER.

Fig. 26.



CONTINUOUS DISPLACEMENT.

Fig. 23 represents a displacer on the principle of Gilbertson's. A is an ordinary tin displacer, except that the rim *c* is soldered around the mouth, in such a manner as to form a water-joint when the rim of the cover, *d*, is placed in it. *a* is a perforated diaphragm: *e* a tin tube open below and above; this is soldered to the lower diaphragm, through which it passes, whilst the upper diaphragm slips over it loosely. In using this displacer, the ingredients are introduced around the tube to a suitable heighth, the upper diaphragm put in its place, and menstruum poured on, the joint half filled with water, and the lid inserted. The atmosphere of the bottle B, communicates with that of A, through the tube *e*.

"Excellent displacers for small operations are made with

ordinary glass lamp chimneys, figs. 24 and 25, by tying a piece of muslin, previously moistened, over their smaller ends, and inserting them in wide-mouthed bottles, as *a*, fig. 24, or through pieces of tin or card, as *b*, fig. 25, in which case they can be placed on any wide-mouthed vessel. One great advantage of these glass displacers is, that the operator can assure himself of the proper stratification of the powder, or moist mass.

"When several operations are proceeding at the same time, and the attention of the operator is much occupied, it frequently happens that the process stops for want of a further addition of menstruum. In this case, the arrangement for continuous displacement, fig. 26, may be advantageously resorted to. A small-mouthed bottle filled with the menstruum will answer instead of the flask. The action is obvious; as the liquid in the displacer descends below the mouth of the inverted flask, the fluid in the latter passes out, and preserves the level of that in the displacer."

ART. XXVIII.—AN INTRODUCTION TO PRACTICAL CHEMISTRY, including Analysis. By JOHN E. BOWMAN, Demonstrator of Chemistry in King's College, London. Philada. Lea & Blanchard, 1849. pp. 303.

THE American student of Chemistry has certainly great cause of satisfaction in the publication of the numerous treatises on his favourite science which, within a few years past, have issued from the press, until each department, general, technological and analytical, has in turn been illustrated. The little work, of which the title page is placed at the head of this notice, will be found to possess some valuable characteristics serviceable to the apothecary who aims at qualifying himself for performing those occasional analytic re-

searches which are from time to time required of him, either to satisfy himself of the purity of his chemicals, or to gratify the curiosity or wishes of the physician in reference to the nature or condition of certain secretions or excretions, in cases of interest. There is a practical tendency in the teaching of the book which points to enabling the student to help himself, as far as possible, by fabricating his own glass tube apparatus, and verifying the purity of his own tests, arriving at the end by the shortest means; in fact, simplifying wherever it is practicable. Qualitative and quantitative analysis are illustrated in special examples exhibiting the mode of procedure from step to step. A number of valuable tables are appended, which add to the usefulness of the work as a hand book of analysis, and as a whole, it is worthy of a place in the pharmaceutist's library.

ART. XXIX.—A PRACTICAL TREATISE ON POISONS; their Symptoms, Antidotes, and mode of Treatment. By O. H. COSTILL, M. D. Grigg, Elliott & Co., 1848. pp. 160.

As a branch of medical science, toxicology has by no means been neglected. The extended works of Christison and Taylor, in Great Britain, and of Beck, in the United States, are evidence of this. But these books, whilst they afford a full exposé of the subject, calculated to throw light on difficult cases, and fraught with interest to the medical student, incipient or advanced, are not sufficiently condensed for hurried reference at the moment of an accident. In this view our author has undertaken to condense into the space of a small duodecimo, such prominent facts relative to the symptoms, antidotes and treatment of poisoning as will prove most useful to the practitioner in his every day routine. The pharmaceutist is occasionally called upon in emergencies for advice, before a physician can be obtained.

and may be of vital service in some instances. The information contained in this little volume will enable him to act with more certainty and efficiency than he will be able to do from the information on this subject usually acquired through pharmaceutical works.

ART. XXX.—ON THE GUM KINO OF THE TENASSERIM PROVINCES.

By the Rev. F. Mason.

In a valuable article by Dr. Royle on Gum Kino, reprinted in the Journal of the Agricultural and Horticultural Society of India, which ostensibly enumerates all the various regions from which it has been imported into England, there is no mention of this article being imported from this coast. Yet long before Dr. Royle compiled that communication, more than one consignment had been made by parties in Maulmain to houses in London of gum kino to the amount of a thousand pounds.

It was brought to Maulmain by an English merchant from the Shan States, and stated by him, as our commisioner at the time informed the writer, to be the production of the *Pa-douk,* the same tree as the one in Maulmain thus denominated by the Burmans. Several years before I had directed attention to this tree as producing an astringent gum resembling gum kino, but the medical officer to whom I submitted specimens of the gum said it was "a kind of dragon's blood;" but after it was known that the gum of the Pa-douk had been sold in London for the veritable gum kino, another medical gentleman tried in his practice the exudation of the tree in his compound in the place of the gum kino in his stores, and reported the effects the same, that their medical virtues were alike.

The next inquiry that arises is for the genus and species of the Pa-douk. When I first came to the coast, all the English residents of my acquaintance called it "Burman Senna," and the surgeon of the station told me that he believed it was a species of senna. The Rev. H. Malcom, D. D., President of Georgetown College, Kentucky, who came out to India a dozen years ago in order to go back again and write a book, has stereotyped in his travels,— "Pa-douk, or Mahogany (*Swietenia Mahogáni*,) is plentiful in the upper provinces, especially round Ava, found occasionally in Pegu." In a native Pali dictionary, found in the Burmese monasteries, Pa-douk stands as the definition of *Pe-tá-thá-lá*, and the corresponding Sanscrit word in Wilson's Dictionary is defined *Pentaptera;* but the Pa-douk does not belong to that genus. In Piddington's Index, however, *Peetshala* stands as the Hindu name, and in Voigt's Catalogue *Peet-sal* as the Bengalee name of *Pterocarpus marsupium;* and this brings us nearer the truth, for Pa-douk is a name common to two different species of *Pterocarpus*, but which look so much alike that they are usually regarded as one species. Undoubtedly one species is *P. Indicus*, and the other, I presume is the one named by Wight, *P. Wallichii*, but which was marked in Wallich's Catalogue *P. Dalbergioides*, from which it differs in no well marked character excepting that the racemes are axillary and simple, while in the latter they are terminal and "much-branched." Wight says of *P. Wallichii*, in his Prodromus, "stamens all united or split down on the upper side only;" so they are sometimes in our tree. In the figure that he gives in his Illustrations they are represented as diadelphous, nine and one, and so they are seen occasionally in our tree; but the more common form is that of being split down the middle into two equal parts, of five each, as in *P. Dalbergioides*. The wood, too, resembles it. "Not unlike mahogany, but rather redder, heavier and coarser in the grain." It is often called "red wood" at Maulmain;

and from the colour of the wood, some of the natives distinguish the species "red Pa-douk," being *P. Dalbergioides*, and "white Pa-douk," *P. Indicus.*

Both these trees produce an astringent gum, which has been exported for gum kino; or whether it was a mixture of both it is not possible to say. Probably the latter, as the native collectors would not probably make any distinction. Possibly it is the production of neither. It may be that *P. marsupium* is found in the Shan States, for it grows, I believe, in Assam; and the man that did not distinguish the two species in Maulmain, would not distinguish them from a third at Zimmay. Be that as it may, this is certain, that these provinces can furnish the commercial world with a large quantity of gum kino. If the result of the experiment which was made be correct, we have a great abundance of it within our own borders; for the Pa-douk is one of the most common forest trees in the provinces from the Tenasserim to the Salwan. It furnishes a considerable portion of the fuel that is sold in Maulmain. But if not, it is certainly abundant in the neighbouring provinces, whose only avenue to market is through our territories.—*Chem. Gaz., from Journal of the Asiatic Society of Bengal.*

ART. XXXI.—ON COD-LIVER OIL.

By Jonathan Pereira, M. D., F. R. S.

The great and daily increasing consumption of cod-liver oil renders all inquiries relating to this therapeutical agent interesting alike to the Physician and the Pharmaceutist. I think, therefore, that some account of the present state of our knowledge, with respect to the chemical nature of this oil, may not be unacceptable to the readers of the Pharma-

ceutical Journal; the more so, as no account of De Jongh's analysis of this oil has yet appeared in this Journal.

It may be well to remind my readers, that while some of the fish-oils* of commerce are obtained exclusively from the liver, others are procured from the adipose tissue diffused through the body of the animal generally. In the former, therefore, we are prepared to find bile constituents which are not obtainable from the latter.

In fishes, properly so-called, the distribution of oil in the body of the animal is not uniform. In the *Gadidæ* or Cod-tribe, (common cod, dorse, coal-fish, pollack, burbot, ling, torsk, &c.,) in the *Squalidæ* or Sharks, and in some other fishes, almost the whole adipose tissue of the animal is concentrated in the form of oil contained in the liver.† On the other hand, in the salmon, herring, sprat and wolf-fish. the oil is more diffused through the body of the animal, and the liver is, comparatively speaking, devoid of it.

The oils obtained from the livers of the different species composing the tribe *Gadidæ*, appear to be very similar in their physical and chemical qualities, and there is good reason for believing that they agree in their medicinal properties. To all of them the term *oleum jecoris aselli*,‡ *oleum*

* I use the term *fish-oils* in its popular and commercial acceptation, and include under it not only the oils obtained from fishes, properly so-called, but also those procured from other aquatic animals, as the *cetacea* and seals.

† Professor Owen, in his *Lectures on the Comparative Anatomy and Physiology of the Vertebrate Animals* (Part 1, *Fishes*, p. 242, 1846,) observes, that "the myriads of dog-fish captured and commonly rejected on our coasts, show that the fishermen have not yet taken full advantage of this anatomical fact, which exposes to them an abundant source of a pure and valuable oil."

‡ Pliny (Hist. Nat., lib. ix. cap. 28) states that there were two kinds of fishes called *aselli*, one smaller, termed *callariæ*, the other found in deep water and denominated *bacchi*; the latter were preferred to the

jecoris gadi, or cod-liver oil,† is indiscriminately applied, though it is commonly used, especially in this country, to indicate the oil procured from the liver of the common cod, (*Gadus morrhua*, Cuv.) It would be better, therefore, to employ the term *oleum jecoris morrhuæ,* or simply *oleum morrhuæ,* when it is intended exclusively to designate the latter oil.

De Jongh, in his "Disquisitio comparativa chemico-medica de tribus olei jecoris aselli speciebus," published at Leyden, in 1843, states that the Bergen (Norwegian) oil is principally obtained from three species, viz. the dorse (Gadus callarias,) the coal-fish (Gadus carbonarius,) and the pollack (Gadus pollachius,) but chiefly from the first.

In general, continental writers distinguish three varieties of cod-liver oil, one white or pale yellow, a second brownish-yellow, a third dark-brown. But between the finest pale yellow or almost colourless oil, and the dark brown cod-oil used by curriers, there is an almost infinite variety of shades, so that no absolute difference can be founded on colour only.

De Jongh made, in Mulder's laboratory, a very elaborate

former. Varro (*Opera Omnia*, p. 21, Durdrechti, 1619) says that these fishes derived their name *aselli*, from their resemblance in colour to the ass.

By some later writers, the term *asellus* has been extended to several species of the cod tribe. Thus, the common cod is called *asellus major;* the ling, *asellus longus;* the coal-fish, *asellus niger;* the whiting, *asellus albus;* the dorse, *asellus striatus:* the pollock, *asellus haifingo*, &c.

A few years ago, a writer in one of the medical journals, mistaking the meaning of the word *asellus*, gravely announced, that "*oil of the liver of the ass*" had been introduced, as a remedial agent, into Germany, from Sweden!

* The term *cod-liver oil* is here used to indicate the oil obtained from the livers of any of the cod-tribe. In this sense it is about equivalent to the Latin term *oleum jecoris aselli.*

analysis fo three kinds of cod-liver oil, the properties of which he thus describes:

Three kinds of cod-liver oil are admitted and described by the writer just quoted. These are *pale*, *pale-brown* and *brown*.

1. *Pale cod-liver oil.*—Golden yellow; odour not disagreeable; not bitter, but leaving in the throat a somewhat acrid fishy taste; re-acts feebly as an acid; sp. gr. 0.923 at 63.°5. Fahr. Cold alcohol dissolved from 2.5 to 2.7 per cent. of the oil; hot alcohol from 3.5 to 4.5 per cent.; in ether it is soluble in all proportions.

2. *Pale brown cod-liver oil.*—Colour that of Malaga wine; odour not disagreeable; bitterish, leaving a slightly acrid fishy taste in the throat; re-acts feebly as an acid; sp. gr. 0.924, at 63.°5. Fahr. Cold alcohol dissolves from 2 8 to 3.2 per cent. of oil; hot alcohol from 6.5 to 6.8 per cent. Ether dissolves it in all proportions.

3. *Dark-brown cod-liver oil.*—Dark brown is transmitted light greenish, in thin layers transparent; odour disagreeable, empyreumatic; taste bitter and empyreumatic, leaving behind in the fauces an acrid sensation; re-acts feebly as an acid; sp. gr. 0.929 at 63.°5. Fahr. Cold alcohol dissolves from 5.9 to 6.5 per cent. of it; hot alcohol from 6.5 to 6.9 per cent. In ether it is soluble in all proportions.

De Jongh found the principal constituents of these oils to be *oleate* and *margarate of glycerin*, possessing the usual properties. But they also contained *butyric* and *acetic acids*, *the principal constituents of the bile*, (bilifellinic acid, bilifulvin and cholic acid,) *some peculiar principles* (among which was the substance called *gaduin*) and not quite one per cent. of *salts*, containing iodine, chlorine, and traces of bromine. Moreover, he found that the oils always contained free *phosphorus*.

The following table shows the proportions of the constituents in the three kinds of oil:

Constituents.	Pale Oil.	Pale b'wn oil.	Brown Oil.
Oleic acid (with Gaduin and two other substances) - -	74.03300	71.75700	69.78500
Margaric acid - - -	11.75700	15.42100	16.14500
Glycerin - - - -	10.17700	9.07300	9.71100
Butyric acid - - -	0.07436	—	0.15875
Acetic acid - - -	0.04571	—	0.12506
Fellinic and cholic acids, with a small quantity of margarine, oleine, and bilifulvin -	0.04300	0.06200	0.29900
Bilifulvin, bilifellinic acid, and two peculiar substances -	0.26800	0.44500	0.87600
A peculiar substance, soluble in alcohol - - -	0.00600	0.01300	0.03800
A peculiar substance, insoluble in water, alcohol, and ether	0.00100	0.00200	0.00500
Iodine - - - -	0.03740	0.04060	0.02950
Chlorine, and traces of bromine	0.14880	0.15880	0.08400
Phosphoric acid - - -	0.09135	0.07890	0.05365
Sulphuric acid - - -	0.07100	0.08595	0.01010
Phosphorus - - -	0.02125	0.01136	0.00754
Lime - - - -	0.15150	0.16780	0.08170
Magnesia - - - -	0.00880	0.01230	0.00380
Soda - - - - -	0.05540	0.06810	0.01790
Iron - - - - -		—	a trace
Loss - - - -	3.00943	2.60319	2.56900
Cod-liver oil - - -	100.00000	100.00000	100.00000

By reference to this table, there will be observed some slight differences in the composition of the three kinds of oil. Whether these are constant or accidental, further investigations are required to determine. But from De Jongh's analysis, it would appear that the *pale* oil is richest in oleic acid and glycerine—that the *brown* oil contains the largest amount of margaric, butyric, and acetic acids, and of the substances peculiar to cod-liver oil—and, lastly, that the pale brown oil is richest in iodine and saline matters.

I now proceed to notice in detail some of the substances which enter into the composition of this oil.

1. *Of Gaduin.*—For the discovery of this substance in cod-liver oil, we are indebted to De Jongh. It may be obtained as follows: Saponify cod-liver oil by means of caustic soda, and decompose the soap thus obtained, by

means of acetate of lead. The resulting lead-soap is to be treated with ether, which takes up oleate of lead and gaduin, and leaves undissolved the margarate of lead. The ethereal solution is dark brown. If it be decomposed by sulphuric acid, brown oleic acid is set free. The brown colour of this acid is owing to the presence of gaduin. To separate the latter, add excess of caustic soda to the oleic acid, by which oleate of soda is formed. This is insoluble in the excess of caustic soda. It is to be dissolved in alcohol, and the alcoholic solution cooled below 32° Fahr., by which the oleate of soda separates, leaving, for the most part, the gaduin in solution. By the addition of sulphuric acid, the gaduin is precipitated from its solution.

Gaduin is a brown substance which is soluble in alcohol, but is rendered insoluble by evaporating its solution to dryness. The alcoholic solution yields, on the addition of neutral acetate of lead, a copious precipitate, composed of $C^{35}\ H^{22}\ O,\ Pb\ O$. If this lead salt be digested with carbonate of soda, it is decomposed, and a soda salt is obtained in solution, from which sulphuric acid precipitates a brown acid. This, when dried at 288° Fahr., was found to have the following composition: $C^{35}\ H^{23}\ O^{9}$.

Gaduin is odourless, tasteless, and of a dark, brown colour. It is completely insoluble in water, but is for the most part soluble in both ether and alcohol. Its insoluble portion augments every time the solution is evaporated. When dry, it is brittle and pulverizable. It is insoluble in both nitric and hydrochloric acids. In sulphuric acid it dissolves, and acquires a blood red colour, but from this solution it is precipitated both by water and alkalies. It is soluble in alkalies. Diffused through water and treated with chlorine it becomes decolourized. In burning, yields an odour first of acetic acid, afterwards of cod-oil, and leaves behind a small quantity of ash.

The *insoluble modification of gaduin*, to which allusion has already been made, is blackish-brown, pulverizable,

insoluble in water, alcohol, ether and diluted sulphuric acid, but by concentrated sulphuric and hydrochloric acid is converted into a black powder, without freely dissolving; in hot nitric acid it gradually and completely dissolves. It dissolves in alkalies, forming a red-coloured solution. In burning, it evolves the odour of acetic acid, and leaves about 0.822 per cent. of ashes. When dried at 238° Fahr. its composition is $C^{39} H^{26} O^{12} = C^{35} H^{22} O^{8} + C^{4}H^{3}O^{3} + HO$: that is gaduin ($C^{35} H^{22} O^{8}$, HO) combined with acetic acid ($C^{4} H^{3} H^{3}$.) But De Jongh's formula scarcely agrees with his experimental result. He says that analysis gave him 7.04 per cent. of hydrogen, whereas his formula indicates about 7.3 per cent.

Berzelius states that when he read De Jongh's account of gaduin, he was struck with the analogy of the reactions of this substance with those of bilifulvic acid, and he tells us that he was disposed to think that gaduin is primitive bilifulvic acid, and that the reddish-brown substance, insoluble both in alcohol and water, which he (Berzelius) separated from bilifulvin by long and numerous operations, is only the insoluble modification of gaduin. This point, however, at present remains undetermined.

Gaduin is contained in all the three varieties of oil examined by De Jongh. At first it is yellow, but under the influence of atmospheric air it acquires a brown colour.

2. *Fatty acids ; margaric and oleic acids.*—These acids, as obtained from cod-liver oil, do not appear to differ in their nature and composition from the same acids procured from other sources. De Jongh analysed them in the form of margarate and oleate of lead. The results were as follows:

Margarate of lead - -	$C^{34} H^{33} O^{3}$ PbO.
Oleate of lead - - -	$C^{44} H^{39} O^{4}$ PbO.

3. *Glycerin.*—This was obtained by saponifying cod-liver oil by caustic soda. The residual lye was decanted from the soda-soap, saturated with sulphuric acid, and the

sulphate of soda separated by crystallization. The residual glycerine was compared with glycerine procured from olive-oil and lead, and found to be darker coloured. All these kinds of glycerine were decolorized by adding basic acetate of lead to the glycerine solution, though they again became coloured when submitted to evaporation.

4. *Bile constituents.*—When cod-liver oil is shaken with water, an emulsion is obtained from which the oil slowly separates. The aqueous liquid becomes clear by filtration. That which had been obtained by shaking the brown oil with water was coloured and empyreumatic; but the other kinds of oil did not colour the water. The liquid invariably had a slightly acid re-action, and the oil which had been shaken with it was clearer, had a feebler odour, and re-acted less powerfully as an acid. By boiling the oils with water, the same results were obtained. By evaporation, the aqueous fluids from all the three kinds of oil yielded a reddish-brown extract, which, softened by heat, was slightly soluble in water, was more soluble in ether, and completely so in alcohol. Alkaline solutions dissolved it, and acids threw it down again in the form of a reddish-brown flocculent precipitate. The extracts had a peculiar odour and a bitterish taste. The quantities obtained from the different kinds of oil were as follows:

	With cold water.	With hot water.
Pale oil . .	0.607 per cent. .	0.513 per cent.
Clear brown oil .	0.890 " " .	0.849 " "
Brown oil .	1.288 " " .	1.256 " "

When successively treated with ether, alcohol, and dilute spirit, all these extracts yielded the same results.

By ether, a reddish-brown, transparent, glutinous extract was obtained, which, melted by heat, stained paper, and had the odour and taste of bile. After some time, small crystals made their appearance in it. It was slightly soluble in water, but readily so in ether, as well as in alcohol. A solution of carbonate of ammonia being added to its ethe-

real solution caused the separation of the mixture into two layers, an upper turbid layer, which by evaporation yielded some drops of *olein*, some crystals of *margarine* and a *brownish mass* which was identical with that procured by the evaporation of the lower layer. This brown mass had a bitter taste, was separated by water into a soluble and insoluble portion, and consisted of *fellinate* and *cholate of ammonia*.

The extract which had been exhausted by ether, yielded to alcohol a blackish-brown, odourless, bitter, shining, hygroscopic mass, which dissolved with difficulty in water, and consisted of biliverdin, bilifulvin, and bilifellinic acid.

Dilute spirit removed from the residual extract a black shining substance, soluble in alkalies, concentrated sulphuric acid, and hot acetic acid, but insoluble in nitric and hydrochloric acids. From its alcoholic solution, baryta-water and acetate of lead precipitated it of a brown colour. It left no residue by burning.

The residue of the aqueous extract, left after the action of the three above mentioned solvents, contained an *organic substance* (whose nature has not been determined) and *inorganic salts*, in which chlorine, phosphoric and sulphuric acids, lime, magnesia, and soda were found, but no potash or iodine.

5. *Iodine, bromine and chlorine.*—Considerable, though as I conceive unnecessary, importance has been given to the fact that cod-liver oil frequently or usually contains both iodine and bromine. To the presence of one or both of these substances has been ascribed the whole or part of the remedial efficacy of the oil. A little consideration, however, would be sufficient to prove that their therapeutical agency in the oil must, if any, be exceedingly small. The proportions in which they exist in the oil is inconstant, though in all cases very small. Moreover, beneficial effects have been produced by the use of the oil, which neither iodine nor bromine are capable of producing.

Some chemists have failed to detect *iodine* in cod-liver oil. De Jongh says, that it is present in every genuine oil, but that the only certain mode of detecting it is to saponify the oil, and carbonize the remaining soap. He confirms Stein's remark, that neither by immediately carbonizing the oil, nor by saponifying it, and then decomposing the soap by acids, can the iodine be detected. It follows, therefore, that iodine exists in the oil neither in the free state nor in that of metallic iodide, but probably in organic combination—perhaps, as an iodic fatty acid. De Jongh determined the proportion of iodine by forming iodide of palladium; every 100 parts of anhydrous iodide of palladium was considered equivalent to 70.34 parts of free iodine.

The largest amount of iodine found in genuine oil is less than 0.05 per cent. If the amount obtained be larger than this, fraud may be suspected. It is said by Dr. Martiny that some dishonest druggists have introduced iodine into the oil for the purpose of augmenting its commercial value. Nay, it is stated that an artificial cod-liver oil has been made by combining iodine with common fish or train oils.

De Jongh detected *bromine* in the oil by Balard's process. The carbonized soap was digested with alcohol, and the alcoholic extract treated with chlorine gas and ether. Its proportion was estimated in conjunction with that of chlorine, as the quantity was too small to admit of accurate separation.

The *chlorine* was determined by precipitating it as chloride of silver from the watery extract of the carbonized soap.

6. *Phosphoric and sulphuric acids.* — *Phosphorus.*— De Jongh determined the presence and quantity of these ingredients in the following way: The oil was saponified by potash, and the soap thus obtained decomposed by hydrochloric acid, by which the fatty acids were separated. From the solution the phosphoric acid was precipitated by

a nitrate of iron (whose proportions of oxide was known) and ammonia, and the sulphuric acid by means of nitrate of baryta.

In order to determine the presence and quantity of free phosphorus or sulphur, a given quantity of oil was decomposed by concentrated nitric acid, and the quantity of phosphoric and sulphuric acids in the oxidized liquid ascertained by the above mentioned method. More phosphoric acid was procured from the oxidized than from the unoxidized liquid, and the proportion of phosphorus was calculated from the excess of acid.

7. *Acetic and butyric acids.*—De Jongh separated these volatile acids from cod-liver oil by adding sulphuric acid to the soda-soap, and distilling the liquid thus obtained. The distilled product had a peculiar odour. It was saturated with barytic water, and evaporated to dryness. One portion of the residue was insoluble in alcohol, the other was soluble. The insoluble salt was acetate of baryta with two equivalents of water($=C^4 H^5 O^5 Ba O$;) the soluble salt was butyrate of baryta. The soluble salt obtained from the pale oil gave the formula $2\ (C^8\ H^6\ O^3)\ Ba\ O,\ 6\ HO$; that procured from the pale brown sort gave the formula $C^8H^6O^3$, $Ba\ O,\ HO$.

Rancid cod-liver oil emits an odour like common fish, or train-oil, and we might, therefore, expect that phocenic acid would be a constituent of cod-liver oil. De Jongh did not detect it; but thinks that phocenic acid may perhaps be resolvable into acetic and butyric acids—a supposition somewhat improbable, seeing that phocenic acid contains considerably more carbon than either butyric or acetic acid. Berzelius observes, that the presence of acetic acid in cod-liver oil, in a form which is not extractable by water, is remarkable, because it leads to the supposition that it is contained in the form of a peculiar fat, which would be the acetate of lipule.

It will be unnecessary to enter into any details with respect to the other constituents of the oil.

The characters by which we judge of the genuineness, purity, and goodness of the oil are partly physical, partly chemical.

The physical characters which are usually employed are principally colour, odour and flavour. The finest oil is that which is most devoid of colour, odour, and flavour. The oil is contained in the cells of the fresh liver, is nearly colourless, and the brownish colour possessed by the ordinary cod-oil used by curriers is due to colouring matters derived from the decomposing hepatic tissues and fluids, or from the action of air on the oil. Chemical analysis lends no support to the opinion, at one time entertained, that the brown oil was superior, as a therapeutical agent, to the pale oil. Chemistry has not discovered any substances in the brown oil which could confer on it superior activity as a medicine. On the other hand, the disgusting odour and flavour, and nauseating qualities of the brown oil, preclude its repeated use. Moreover, there is reason to suspect that, if patients could conquer their aversion to it, its free use, like that of other rancid and empyreumatic fats, would disturb the digestive functions, and be attended with injurious effects.

Of the chemical characters which have been used to determine the genuineness of cod-liver oil, some have reference to the iodine, others to the gaduin or to the bile constituents. I have already stated that some fraudulent persons are said to have admixed iodine (either free iodine or iodide of potassium) with train oil to imitate cod-liver oil. The presence of this substance may be readily detected by adding a solution of starch and a few drops of sulphuric acid, by which the blue iodide of starch is produced; or the suspected oil may be shaken with alcohol, which abstracts the iodine.

But though we may thus readily prove that the suspected oil contains no artificially added iodine, the iodine which is naturally contained in, and more intimately combined with the oil, may be frequently recognized by another process. Marchand gives the following directions for detecting it: Saponify the oil with soda, carbonize the soap thus obtained, digest the coal in distilled water, add a drop of starch paste, and subject the mixture to the action of a voltaic battery, the positive pole being placed in contact with the starch paste, the negative pole with the solution. If iodine be present the starch becomes blue. Marchand states that by this test, the iodine can be detected in the urine of a patient soon after he has taken the oil. This, however, is certainly not always correct, for I submitted the urine of a young gentleman, who, for several weeks had taken with great benefit a table-spoonful of cod-liver oil thrice daily, to the action of a galvanic battery of fifty pairs of plates for several hours, without obtaining the slightest evidence of the presence of iodine.

Sulphuric acid has been employed as a test for cod-liver oil. If a drop of concentrated sulphuric acid be added to fresh cod-liver oil, the latter assumes a fine violet colour, which soon passes into yellowish or brownish-red. Some samples of oil produce at once the red colour, without the preliminary violet tint. Gobley, who noticed this reaction in the case of oil of the liver of the ray, says, that oil which has been prepared by ebullition in water, does not possess this property, but yields with sulphuric acid a clear red colour. This, however, is an error, at least with respect to cod-liver oil. It has been erroneously supposed by some persons that this violet colour was due to the evolution of iodine by the action of the acid on an alkaline iodide contained in the oil. If that where the case, the presence of a little starch-paste would be sufficient to convert the violet into an intense blue colour; which is not the case. The

colouration in fact depends on the action of the sulphuric acid on some one or more organic constituents of the oil, and the following facts lead me to infer that it is in part due to the presence in the oil of one of the constituents of the bile.

It is well known that in 1844, Pettenkofer pointed out a new test for bile. If to a liquid supposed to contain bile, about two-thirds of its volume of oil of vitriol be added, the liquid kept cool, a few drops of a solution of cane-sugar (four or five parts of water to one of sugar) be added, and the mixture shaken up, a violet red colour is produced, provided bile be present. This test succeeds very well, if we dissolve a little extract of ox-bile in water, and test the solution with sugar and oil of vitriol. The colour developed agrees with that produced by the addition of oil of vitriol to cod-liver oil, which De Jongh has shown, contains the essential constitutents of the bile.

Pettenkofer remarks, that the presence of a very great excess of chlorides will change the violet red-colour into a brownish-red. This fact is deserving of notice, because it may aid in accounting for the fact that some specimens of cod-liver oil strike a brownish-red, not a violet-red colour, with oil of vitriol.

Strecker confirms Platner's observation that both cholic and para-cholic acids produce the same colour with sugar and oil of vitriol, as bile does; so that Pettenkofer's test doubtless acts on one or both of these acids. Now De Jongh has shown that cholic acid is contained in cod-liver oil, and we have, therefore good reason for believing that it is in part by the action of oil of vitriol on this acid, that the violet red colour is produced in cod-liver oil.

But it is well known that for the development of this colour in bile it is necessary to use, besides oil of vitriol, a third agent (sugar.) Pettenkofer observes that for cane-sugar we may substitute grape-sugar or starch ; in fact, any substance which can by the action of oil of vitriol be con-

verted into grape-sugar. No such substance has hitherto been detected in cod-liver oil, and, therefore, it may be said the necessary ingredient to produce this characteristic re-action of oil of vitriol on cholic acid is wanting. Strecker has recently supplied the wanting link. In his valuable paper on ox-bile, to which I have already referred, he observes that acetic acid may be substituted for sugar. To the liquid supposed to contain bile add a few drops of acetic acid, and then concentrated sulphuric acid, when a magnificent purple-red colour is developed. If the quantity of bile be small, it may be necessary to use heat. Now, as cod-liver oil contains acetic acid, we have the requisite agent to enable the oil of vitriol to act on the cholic acid, and the development of the purple or violet-red colour is then readily accounted for.

I have already noticed the red colour produced by the action of oil of vitriol on gaduin (supposed by Berzelius to be derived from the bile.) Here then is another source for the red colour caused by the action of sulphuric acid on cod-liver oil.

It follows, therefore, from what has been now stated, that oil of vitriol is a test for liver oils. It does not distinguish one liver oil from another, for it re-acts equally with the oil of the liver of the ray and with oil of the liver of the common cod. Neither does it distinguish good cod-liver oil from bad, for it produces its characteristic re-action both with common brown cod-oil, and with the finest and palest qualities. But it serves to distinguish oil procured from the liver, from oil obtained from other parts of the animal.
Pharmaceutical Journal, Feb. 1849.

ART. XXXII.—ON THE RIPENING OF FRUITS AND THE GELATINOUS PRINCIPLES OF VEGETABLES.

By E. Fremy.

The author gives the following summary of the facts detailed in his memoir on the above-named subjects:—

1. There exists in the tissues of vegetables, and principally in the pulps of fruits and of roots, a substance insoluble in water, which he has named *pectose;* its characteristic property is that of being converted into pectine, by the influence of the weakest acids. It differs essentially from cellulose in all its properties.

2. Pectine exists in the juices of ripe fruits; it may be artificially obtained by causing boiling weak acid liquors to act upon pectose. Pectine ought to be considered as a weak acid; it does not precipitate the neutral acetate of lead, and changes into pectic acid under the influence of soluble bases.

3. Pectine, submitted for some time to the action of boiling water, acquires the property of precipitating neutral acetate of lead, and is converted into a new substance which M. Fremy calls *parapectine;* it is neutral to test-papers, and occurs in the juices of perfectly ripe fruits.

4. Parapectine is transformed, under the influence of acids, into a substance which the author calls *metapectine;* it has the properties of a weak acid, reddens tincture of litmus, and precipitates chloride of barium; it may be named *metapectinic acid.*

5. The preceding substances form compounds which are soluble in a certain number of acids, and principally with sulphuric and oxalic acids. These compounds are crystallizable, and form gelatinous precipitates with alcohol.

6. There accompanies pectose in vegetable tissues, a peculiar ferment called by M. Fremy *pectase;* this has the property of transforming pectine successively into two gela-

tinous acids, which are the pectosic and pectic acids; this change occurs without the presence of air or the disengagement of gas, and constitutes the *pectic fermentation,* which may be compared to the *lactic fermentation.* Pectase exists in vegetables in two states, one soluble and the other insoluble.

7. When pectine is submitted to the action of pectase, the acid first formed is a new acid, the *pectosic;* it differs from pectic acid in being completely soluble in boiling water.

8. Pectosic acid is transformed into pectic acid by the prolonged action of pectase; the pectosic and pectic acids are also formed when pectine is added to an alkali either free or carbonated, or under the influence of lime, barytes or strontia.

9. Pectic acid dissolves in considerable quantity in neutral alkaline salts, and especially in ammoniacal salts, which contain an organic acid; gelatinous double salts with an acid reaction are then formed, which are precipitated in a gelatinous state by alcohol.

10. Pectic acid, kept for several hours in boiling water, completely dissolves, and is transformed into a new acid, the *parapectic acid.*

11. Parapectic acid changes, under the long-continued influence of water, into a powerful acid, the *metapectic acid.*

These two last acids arise under several circumstances, and principally by the reaction of acids, alkalies, or of pectase, pectine and pectic acid; they possess the property of decomposing by ebullition the double tartrate of potash and copper, like glucose.

12. Gelatinous substances exposed to a temperature of 392° Fahr. disengage water and carbonic acid, and are converted into a black pyrogenous acid, which the author calls *pyropectic acid.*

13. Gelatinous substances exhibit all the generic characters of acids, the capacity of saturation and their power

augmenting in proportion as they recede from pectose ; they appear to be all derived from a ternary molecule $C^8H^5O^7$, and differ from each other only as to water.

14. The properties of gelatinous substances of vegetables afford an explanation of the alterations which a fruit undergoes when submitted to the action of heat, as well as of the formation of *vegetable jellies*. Vegetable jellies may be produced—1st, by the conversion of pectine into pectosic and pectic acids under the influence of pectase ; 2ndly, by the combination of pectic acid with the organic acids contained in fruits.

15. The pectose contained in green fruits is successively transformed, during ripening, into pectine, metapectine, and metapectic acids. These changes are determined by the influence of acids and pectase.

It will appear from this summary, in the opinion of the author, that after having ascertained the nature of the principal properties of the substances which constitute the pulp of certain fruits, he was led to observe that the gelatinous substances of vegetables undergo modifications by the influence of reagents entirely comparable to those to which they are subject during vegetation.—*Chem. Gaz. from Ann. de Ch. et de Phys.*

ART. XXXII.—REPORT OF THE SECRETARY OF THE TREASURY, with the Report of Dr. Edwards on the practical operation of the law for the prevention of the importation of spurious and adulterated drugs and medicines. January 23, 1849. Read and ordered to be printed.

TREASURY DEPARTMENT, January 22, 1849.

SIR : I have the honour herewith to submit a report made to me by the Hon. T. O. Edwards, (who was appointed by

this department for that service,) of the results of an examination, extending through a period of five weeks, made by him at the ports of Boston, New York, Baltimore, and Philadelphia, into the practical operation and effect of the act passed at the last session of Congress, for the prevention of the importation of spurious and adulterated drugs and medicines.

The report contains many valuable statements and suggestions, which are commended to the favourable consideration of Congress. It is regarded also, by this department, as highly important and useful in its suggestions, with respect to an efficient and satisfactory execution of the law to which it refers.

As this department, under existing appropriation laws, is empowered only to pay the actual expenses of the agent while on this service, it is respectfully recommended that an adequate appropriation be made for the compensation of Dr. Edwards for the time and labour devoted by him to this investigation.

I have the honour to be, very respectfully, your obedient servant,

R. J. Walker,
Secretary of the Treasury.

Hon. G. M. Dallas,
Vice President of the United States,
and President of the Senate.

Washington City, December 26, 1848.

Sir: In accordance with the request and instructions of your letter dated October 10th, "to visit the ports of Baltimore, Philadelphia, New York, and Boston, for the purpose of examination, and to enquire whether the act of 26th June last, to prevent the importation of adulterated drugs, &c., is fully and properly carried into effect," I beg leave to report: that I have visited the designated ports, and during the greater part of the month of November, was diligent in my investigations.

On the 7th of that month I reached New York, and having acertained that three-fourths, or more, of the importations of drugs, medicines, &c., are made at that port, my time and attention have been most directed to investigations there.

As is ever to be expected, the immediate operations of a new law will meet with opposition from those whose interests it effects. No bill ever met with more decided opposition on its introduction than the act of 26th of June last. A large number of honest importers were fearful that great injustice and injury would result to business. Many commission houses attacked it, with a violence unexpected by its friends; while one or more leading commercial journals in New York, for weeks before the passage of the law, devoted large space to its attack, and after their arguments had been answered, resorted to abuse of its authors and friends.

The advocates of the bill have ever been willing to test its advantages by time and practical operation, and I am happy to say that my careful investigations warrant me in the opinion, that whilst the law in its practical operation has not fulfilled the predictions of its enemies, it has more than realized the anticipations of its friends. I have conversed with a number of the importers of drugs in the various cities, and especially in New York, whence came most of the opposition, and I am confident in the assertion that the early prejudices are not only rapidly passing away, but that all are now inclined to view the law with sentiments differing widely from those entertained at its introduction. A very limited number now advocate that freedom of trade which gives to the designing and dishonest drug dealer power not only over the health but the lives of the community. Strongly impressed as were the friends of the bill of its ultimate success, and that an enlightened public opinion would sustain and foster it, as beneficial to the physical well being of society, we were not prepared for so full an expression of its benefits, and miscalculated its strength of confidence in all classes of the community. I

have received over six hundred letters from physicians from all parts of the Union, commending in the highest terms the action of Congress on this subject. National and State medical societies, medical professors and classes, have passed resolutions in its favour.

All the medical Journals of the United States, and numerous foreign periodicals, have published the law and the report of the committee entire. The collector of New York, in answer to my inquiries, kindly furnished me with a letter of which the following is a copy.

CUSTOM HOUSE, NEW YORK
Collector's Office, November, 14, 1848.

SIR: In reply to your letter of the 9th instant, requesting me to furnish you with an abstract showing the effect of the passage of the act of 26th June, 1848, to prevent the importation of adulterated and spurious drugs on the revenue at this port, I have to state that I have no record to refer to that will enable me to put you in possession of the exact quantities and value of drugs, &c., rejected under its operation.

Dr. Baily, our special examiner, can I presume furnish you from the memoranda of his office with correct data under these respective heads.

In regard to the complaints alleged, viz: the reduction of receipts in the way of duties, if it were indeed true, it should not in my opinion have any effect in deciding the merits of the bill. If the preservation of life and health are important objects to secure in a community, legitimate means to realize that end are of vital importance. To permit the introduction of adulterated and spurious articles of medicine amongst the people, does in effect render the antidote worse than the bane, inasmuch as it fails to realize the effects intended in its prescription.

It will, however, I think, be in the end seen that the law benefits not only the public, (whose interest in it is para-

mount,) but also that of the revenue. Already certain drugs have been imported of a superior quality to those of the same kinds, heretofore, and at a cost of over 100 per cent. on former invoices.

The immediate operation of a new law always occasions more or less dissatisfaction in the trade it effects, but I am credibly informed that regular dealers in drugs express themselves satisfied that the law is a necessary and beneficial one, and absolutely necessary to the prevention of injustice and injury to the community.

Dr. Bailey, whose position brings him in more direct contact with venders of drugs, will, from his own knowledge and experience, be enabled to inform you more particularly on the several points involved in your inquiry. As far as the action of this office is concerned, the instructions of July 8th, 1848, have in all respects been confirmed.

I am, sir, yours, very respectfully,

C. W. LAWRENCE.

HON. THOMAS O. EDWARDS, New York.

As an example of the increasing popularity of the bill, I am credibly informed that the head of one of the principal importing houses in New York, who took strong ground against the passage of the law in question, and who spent the greater part of the past summer abroad in making purchases, establishing correspondence, &c, wrote home to his partners, that from what he had seen during his travel, of the manner drugs, medicines, and chemicals were prepared for the Amercan market, he was satisfied that our drug law, judiciously carried out, would not only be of great benefit to the community, but likewise to the honest importer and dealer.

Many similar changes in sentiments could be detailed, if necessary. The only or greatest murmurings and disaffection at present, are confined to a few commission houses,

whose interests and affections lie on the other side of the ocean,—and to a comparatively small number of our own people, with whom the almighty dollar would seem of more importance than the lives and happiness of their fellow beings; men whose entire interests have been identified with extensive and profitable speculations in that description of merchandise, the importation of which is now most justly prohibited.

The instructions of the eighth of July last doubtless contained all that was then thought necessary for the full and satisfactory execution of the law. In its progress, new questions have arisen, and, in accordance with your request, I will submit such additional requisitions as time and circumstances may have developed.

Had the law in its fulfilment required but one or two examiners, there would have been no difficulty in establishing standards, and of arriving at uniformity. The instructions referred to have been fully and fairly carried out, with one or two exceptions, not at all affecting the interest of the law, and these occurred immediately after its enactment, and will not again arise. That there should be differences of opinion, in relation to the relative purity and strength of many medicinal substances, was to have been expected. Yet the uniformity of chemical tests, the plain references of the law to the established standards, have given a uniformity entirely gratifying. I have propounded to the several examiners a number of questions, and as there exists in most of the answers a great similarity, I have deemed it proper to avoid prolixity to condense the points of agreement, and report such facts as apply to the objects of my mission.

In answer to the question, what articles of drugs, medicines, &c., have you rejected? in what quantities? and whence were they imported? the examiner at New York reports, that on

July 19,	he rejected,	6,650	lbs.	rhubarb root, from Canton.
" 21,	"	931	lbs.	opium, from Marseilles.
Aug. 10,	"	750	lbs.	opium, from Marseilles.
" 11,	"	2,940	lbs.	jalap root, from Tampico.
" 31,	"	2,249	lbs.	rhubarb root, from London.
Sept. 1,	"	645	lbs.	rhubarb root, from London.
" 5,	"	1,414	lbs.	gum gamboge, from London.
" 8,	"	545	lbs.	rhubarb root, from Hamburgh.
" 9,	"	1,400	lbs.	senna, from Leghorn.
" 19,	"	2,900	lbs.	spurious yellow bark, from Bordeaux.
" 20,	"	878	lbs.	rhubarb root, from Canton.
" 22,	"	758	lbs.	opium, from London.
" 25,	"	1,783	oz.	iodine, from London.
" 27,	"	1,075	lbs.	rhubarb root, from Marseilles.
" 26,	"	875	lbs.	jalap root, from Vera Cruz.
" 29,	"	3,400	lbs.	jalap root, from Vera Cruz.
Oct. 23,	"	788	lbs.	rhubarb root, from London.
" 23,	"	227	lbs.	gum myrrh, from London.
" 25,	"	13,120	lbs.	spurious yellow bark, from Marseilles
" 26,	"	1,875	lbs.	spurious yellow bark, from Bordeaux.
Nov. 11,	"	412	lbs.	gum myrrh, from London.
" 27,	"	1,280	oz.	iodine, from London.
" 28,	"	860	lbs.	opium, from Smyrna.
" 30,	"	185	lbs.	rhubarb root, from London.
Dec. 5,	"	156	lbs.	opium, from London.
" 5,	"	1,065	lbs.	gum myrrh, from London.
" 23,	"	12,800	lbs.	spurious cinchona bark, Carthagena.

The opium, gum myrrh, gum gamboge, iodine, and senna, were greatly adulterated, and, (with the exception of the iodine, were also deteriorated by age and other causes. A considerable portion of the rhubarb root was also in a deteriorated and decayed condition from age, and the remainder had been exhausted of its active properties for the purpose of making extracts. Much of the jalap root was of the spurious or bastard varieties, mixed with a small proportion of the genuine root.

The spurious yellow bark was in its natural state, but being of those bastard varieties of cinchona that afford no *quinine* and very little if any *cinchonine*, it is worthless for medicinal purposes. It has heretofore, from its low

price ($4 per 100 pounds) been imported, powdered, and not only extensively used in the adulteration of the genuine (Cinchona cordifolia) yellow bark, but sold in large quantities to the unsuspecting for the genuine article.

Under the 4th section of the law allowing a re-examination "in the event of disaffection to the examiner's return," two cases of appeal have occurred in the New York customs, one on six cases of opium, the other on ten cases of rhubarb root. Four cases of the opium were exported, and the remaining, on the return of the analytical chemist, "that the article was genuine and pure, only of a weak standard of strength," were admitted to entry by the then acting Secretary of the Treasury; the rhubarb root was rejected.

From the comparatively small number of importations, and the recent appointment of the examiner at the port of Philadelphia, there has as yet occurred no necessity for the execution of the penalty of the law. The articles thus far have been highly satisfactory: the examiner has fulfilled the requisition of the law, and to the fullest extent has carried out the instructions of the department.

The same may be said of the port of Boston. But one instance of condemnation has occurred there, and I am pleased to report a just and proper estimate of responsibility, and a determination to carry into execution to its utmost limit, on the part of the examiner of this port, the law, and the instructions under which he was appointed.

My examinations have resulted equally satisfactorily at the port of Baltimore. But one instance of exclusion is reported, and no appeal thereon. The examiner is qualified and diligent, and has, in every instance, fulfilled the requisition of the law. The unanimous testimony of collectors and examiners agree that the law is not only successful in detecting adulterated drugs and medicines, but is a powerful preventive of their presentation for entry at the various ports.

A question of considerable importance, and one requiring

your immediate attention and instructions, here presents itself. While it is plain the examiner will adjudge "the purity, strength, and fitness for medicinal purposes" of the articles presented, is he also to be the judge of their commercial value? No one could possibly be better acquainted with an article, than he who has analysed and thoroughly examined its component parts. My opinion is, that instructions to the purport that a chemical standard, provided it accord with the standard prescribed by the law, should not only test its admissibility, but should also fix a corresponding value, and that the examiner should himself raise, when necessary, the invoice price and affix the value for duty. The law has been variously construed at the different ports by the appraiser's department, and instructions will ensure a much needed uniformity. A modification of the law, by some urgently demanded, to the effect that the government should be liable for all expense in the analytical examinations called for by the importers, provided the return of the examiner be not sustained, we conceive as unnecessary. It exacts from owners and consignees no more than laws of long standing touching other articles of merchandise, and a departure from long established usages in this department of commerce I would not recommend.

We find no opposition to a strict examination and analysis of chemical preparations before entry, yet many fear the operation on crude drugs. Ordinarily, drugs, such as gums, roots, &c., are imported in a crude condition, and were a strict account demanded, but very few would be passed as "fit for medicine." To exemplify: It is very rare that an entire bale of jalap root can be declared as fit for use. Some bulbs will be mature, others worthless. A recent invoice of fourteen bales was offered at New York, only two of which were declared proper for entry. The remaining twelve contained so great a preponderance of the immature root and adulterations, as to require its rejection. I would suggest, as a benefit to the treasury, and a matter of favour

to the importer, that he be allowed to break bulk and select the good, and have necessary testimony furnished him of the identity of the invoice, to enable him upon re-shipment of the rejected portion to recover from the foreign house from whom he purchased. The case just stated would have furnished from six to eight bales of a genuine article, yet only two bales were admitted to entry. During my stay in Boston, a case of opium, weighing 70 pounds, was presented for inspection. Twenty pounds was proven to be pure and entirely satisfactory, whilst the remainder was composed of herbaceous matter, into which tobacco leaves and stems entered largely. The good was placed in the case to sell the bad. The examiner very properly condemned the entire case, and it was re-shipped in the vessel that brought it. The lumps were susceptible of division, and had the above suggestion been compatible with the instructions, the good opium could have been retained. How far the importer would avail himself of the suggestion, remains to be seen, provided the department deem the privilege worthy of trial. It would rob the enemies of the bill of their principal objection, and would clearly demonstrate that those opposed to the traffic in adulterated drugs have no desire to trammel legitimate business.

I would suggest as important, that the examiners, in order efficiently and satisfactorily to execute the trusts confided to them, be provided with proper offices, books, suitable apparatus, tests, and test glasses, &c., &c., and as provision for this comparatively trifling expense was inadvertently overlooked in framing the law, it is very desirable that a small appropriation, at an early day, be made for the purpose. One thousand dollars, to be expended under the direction of the Secretary of the Treasury, for the six officers, would it is estimated, meet this necessary demand. The responsible duties, compared with the salaries of these officers, in my opinion, justly challenges the liberality of the government in furnishing necessary implements for the faithful discharge of his duties.

A case requiring decision, and involving nice discrimination, was recently presented at the New York customs, and presuming it has, or may, very shortly be submitted to you, I beg leave, in accordance with your request, to offer some suggestions upon it. Some fourteen thousand pounds of Maracaibo bark was presented for entry, and rejected as "unfit for medicine." It is one of the numerous varieties of cinchona, but possesses neither quinine nor cinchonine, (the distinguishing medicinal qualities of those barks.) It was invoiced at $4 per 100 pounds. The genuine Peruvian bark is worth $70 per 100 pounds. No one doubted the genuineness of this bark, but the question arose "is it fit" and "proper to to be used as a medicine," possessing nothing of medicinal virtue, save a slightly astringent property, and in that inferior to many species of our oaks, and vastly inferior to the Cornus Florida, (dog-wood ;) it has one fatal quality, and one on which depends its danger, its colour. It so closely resembles the yellow valuable variety of the cinchona, that an admixture of fifty per cent. would not be detected without analysis, and the adulterations of that valuable and indispensable medicine have been almost exclusively with this article. The owner of this bark admits that no physician would prescribe it as a medicine, but plead its use for tooth powder. 'Tis true, it would make tooth powder, but the assurance it would be turned to that account, and that alone, was wanting. It is also alleged as being used for tanning, and the examiner has consented, when satisfactory evidence of its application to that purpose alone be presented, to reconsider the exclusion.

Construing the law literally, yet in its most obvious signification, the fitness of the article for medicinal purposes governed the decision of the examiner. Most heartily do I acquiesce in that decision, and accord to him skill, and and an honest fulfilment of the duties of his post ; placed there to guard against impositions of the most dangerous kind, he has withstood the arguments of the interested with

gallantry and firmness. It is not a medicine, and he who imports it as such commits a fraud, designed to be prevented by the act of 26th of June last. I am informed by good authority that no other market is now open for this article, as all nations exclude it on account of the impositions resulting from its use.

An elevation in the standard of purity and strength is manifest in all the recent importations, but particularly conspicuous in the leading and most necessary articles in the practice of medicine. Opium, morphine, quinine, iodine, hydriodate of potass, calomel, blue pill mass, medicinal extracts, cinchona, rhubarb root, jalap root, scammony, senna, gum gamboge and other medicinal gums, are decidedly improved in quality. The chemical preparations are now imported of a satisfactory character; properly labelled, &c.

That adulterations of medicines, to a very considerable. extent, will be carried on in this country, none will deny, Had Congress the power to prevent it, by a general law, it might be avoided. The general government has done all in its power, and it is incumbent on the several States, by special statute, to render penal the conduct that endangers the life and health of the citizens. No one can believe that adulterations here would be carried to the extent practised by foreigners. It is scarcely presumable that all the druggists will be engaged in a traffic so nefarious. The rivalry of business, the pride of the profession, and the higher and nobler motives of humanity, will be equal to the ingenuity and invention of the dishonest, and will effect its exposure If this law be faithfully complied with, the house that sells an adulterated and spurious medicine, *must needs have made it*; and the watchfulness of the profession, together with the numerous medical journals, jealous of the interests and informed of the rights of the medical profession, will proclaim the fraud. Law and public opinion will point to the remedy. The law requiring all medicinal agents imported to be pure and of an acknowledged standard, will

give an impetus to the employment of talents and capital in our own country. Having the advantage of the protection afforded by the duty, and a further guard against frauds by this law, American enterprise will soon rival older and more experienced chemists in the manufacture of necessary articles. American quinine has gained a just celebrity, and is extensively used by those who have long been familiar with the impositions of labels and other counterfeit representations of popular foreign chemicals, and has recently become an article of export.*

An argument used with much pertinacity by the opponents of this law on its introduction, and one which time alone could test, was, that the revenues of the government would be greatly injured by its restrictions. It has been my constant care to ascertain this important fact; and I am most happy in the belief that, although it cannot be demonstrated by figures, (as no separate record has been kept in the various districts by which a comparison could be instituted,) yet proper inferences are deducible of its satisfactory action in this particular. The collector at New York acknowledging his want of record to answer the question, as will be seen by reference to his letter, says: "In regard to the complaint alleged, viz. the reduction of the receipts in the way of duties, if it were indeed true, it should not, in my opinion, have any effect in deciding the merits of the

* I have on my table specimens of the quinine manufactured by Rosengarten & Denis, of Philadelphia, which fully equals the best French quinine in purity and strength. These gentlemen recently exported a large quantity, and by reference to the London circular, of November 3d, we find it met a ready sale, as "the quality was fine and has been much admired." Messrs. Farr, Powers & Weightman, also of Philadelphia, make quinine of equal purity to any in the world. I have procured from their establishment a sample, which, on analysis, indicates great purity, and its use has fulfilled my highest expectations. These gentlemen also manufacture morphine equal to Pelletier.

bill. If the preservation of life and health are important objects to secure in a community, legitimate means to realize that end are of vital importance. To permit the introduction of adulterated and spurious articles of medicine amongst the people, does, in effect, render the antidote worse than the bane; inasmuch as it fails to realize the effects intended in its prescription. It will, however, be seen in the end, I think, that the law benefits not only the public, whose interest in it is paramount,) but also that of the revenue. Already certain drugs have been imported of a superior quality to those of the same varieties heretofore, and at a cost of over 100 per cent. on former prices."

In the absence of all record, I deem it not unreasonable to infer that the effect of this law is, or ultimately will be, to increase the revenue, particularly under an ad valorem tariff. The greatly increased value of the higher grades of drugs, &c., now imported, has more than counterbalanced any loss sustained by the revenue on the articles rejected. Many invoices of high priced drugs, &c., are now ordered and imported freely, that were entirely unknown in this market, previously to the passage of this law, on account of the immense quantities of inferior articles everywhere to be met at reduced rates. The example of two or three articles will explain the reason of the opinion that the present bill will increase the revenues. Turkey rhubarb, Aleppo scammony, and genuine Peruvian bark, were scarcely to be found on sale twelve months since. The scammony, then imported, came invoiced at from forty to ninety cents per pound, a worthless article. The importation of this has been excluded, and in its stead we have the Aleppo imported at from five dollars to five dollars and fifty cents per pound. The Turkey rhubarb that found no market here, is now imported in considerable quantities at from two dollars to two dollars seventy-five cents per pound, and is readily sold. Sixty cases of East India rhubarb were recently imported at thirty-five cents per pound,

and were readily sold, thus supplying the place of the worthless articles heretofore imported at from five to ten cents per pound. By reference to the rejected articles at New York, you perceive Peruvian bark to the amount of seventeen thousand eight hundred and ninety-five pounds. This bark was invoiced at from four to fifteen cents a pound. In its stead, a genuine article, invoiced at *seventy cents* a pound to the amount of *forty thousand pounds*, has been received from Valparaiso. *Three thousand* pounds from London, and an invoice of *twenty-eight thousand* pounds was expected during my stay in the city. The opium now imported is, on an average, twenty-five per cent better than formerly, and is invoiced at a corresponding rate higher. The gum myrrh evinces an improvement of one hundred per cent. in quality, and to demonstrate there is no scarcity of purchasers, one half of the last importations were sold immediately on its arrival. I might exhaust the entire catalogue of drugs, &c., but deem the above enumeration sufficient.

The facts set forth appear ample to prove that the extra duty accruing from the greatly advanced prices, corresponding with the improved quality of this class of merchandise in comparison with former importations, is sufficient to permanently and materially increase the revenue.

Revenue to the amount of the salaries of the various examiners has accrued to the government from penalties. Although in one or two of the offices there has as yet occurred no necessity for the condemnation of articles, yet in all, many invoices have been "marked up," and the penalties have more than equalled the salaries of the various examiners.

There being no separate record of the import of drugs, medicines, and chemical preparations, at the different ports, by which the department can obtain with precision the information that it would be desirable to have embodied in the yearly statistical reports for the benefit of Congress and the

country, I would suggest that the special examiners be instructed to keep such record and to make quarterly reports to the department, and that the examiner at New York be allowed a clerk to aid him in his extra duty, as his position is not only responsible, but exceedingly arduous. To show in some measure the extent of his labour and usefulness, in justice to him, as he still continues, at no extra expense to the government, to examine and pass, in connexion with and in addition to his legitimate duties under the act in question, all coarser chemicals, and most other articles used in the arts, I will here remark, that on examining the books of general entry of passed invoices in this office, I found that the sum total of merchandise passed and noted by him since the 12th of July last, the day on which he received his present appointment of special examiner of drugs, medicines, &c., amounted to over *two millions of dollars.*

The deductions clearly inferable from the preceding are,

1st. An elevation in the quality and purity of the medicinal agents imported.

2d. An entire prevention of adulterated and deteriorated drugs, &c., from entry and use.

3rd. No embarrassments to the honest importer and dealer.

4th. An increased revenue.

5th. Protection to the medical profession and community, an increasing confidence, and an earnest desire on the part of the people for the continuance of the law and its faithful application.

Every desirable facility has been afforded me by various officers of the customs in the prosecution of my inquiries. The examiners at the various ports are good selections, and are diligent, faithful, and capable. The post at New York is one of great labour and responsibility. The examiner is fully competent to the task. With a thorough knowledge of his business, and a devotion to his profession, he

has carried out the requisitions of the law faithfully and fearlessly. No man in the country could have more satisfactorily executed the trust.

I would be doing injustice to my own feelings were I to close this communication without tendering to you, sir, my sincere thanks for the prominent part you have taken in bringing this important matter to its present success and usefulness. The encomiums of a number of the New York Journal of Medicine, recently published, are well merited, and the references to the part you have taken in the inception and progress of this law are true. In the midst of your numerous and responsible duties, you have not been unmindful of the claims of science and humanity. From the appointment and directions given to Dr. Bailey, at New York, previously to the passage of this bill, to the present moment, you have ever had an earnest desire, and have taken a leading position to consummate its benefits. That it may fulfil our largest expectations, and that your health and life may long be spared to your country, is the wish of

Your humble servant,

T. O. Edwards.

Hon. R. J. Walker, Secretary of the Treasury.

Art. XXXIII.—On the Preparation of Oxide of Zinc by Combustion.

By Mr. G. D. Midgley.

The author calls the attention of Pharmaceutical Chemists to what he conceives to be the advantages resulting from the preparation of oxide of zinc by combustion. Having directed his attention to this subject for many years, and constructed an apparatus for the purpose of effecting the combustion of zinc, he has been enabled to overcome the

difficulties which had been previously experienced in the process. The apparatus employed by Mr. Midgley is a large muffle, which is heated to redness in a furnace of suitable construction. The draught of air necessary for supporting the combustion is conveyed from the muffle by a tube passing through the top of the furnace and terminating in a vessel containing water, in which the portion of oxide which is carried off in the current of hot air is retained. With an apparatus of this kind he makes a hundred weight or two of the oxide at a time, by a continuous process, the zinc being introduced into the muffle from time to time as the combustion proceeds. Any particles of metallic zinc that may remain mixed with the oxide are subsequently separated by a sieve. The author states that the zinc or spelter of commerce is now made extremely pure, and yields by combustion a white oxide, which is free from cadmium or other metals. He expresses an opinion that the oxide obtained by this process here described, is more efficacious when used in the form of ointment, than that made by any of the processes which have been published in the modern Pharmacopœias. In confirmation of this, he alludes to a statement published some years ago by Mr. Redwood, from which it appeared that the so-called oxide of zinc of commerce, contained large quantities of water, and of carbonic or sulphuric acid. He also recommends the use of oxide of zinc made by combustion, as a subtsitute for white lead in the preparation of paint. Among the advantages which he conceives would result from this substitution, are, the superior preservative effect of the oxide of zinc, the fact of its not being altered in colour by sulphuretted hydrogen or other gases, and the avoidance of those injurious effects upon the health which are experienced by the workmen employed in the manufacture of white lead.

Mr. Squire inquired if Mr. Midgley had practically tried the use of oxide of zinc as a substitute for white lead in paint. He (Mr. S.) had tried it some years ago in his labo-

ratory, and found that it was very deficient in the power of *covering*, which is dependent upon the opacity of the paint.

Mr. Midgley said he had seen it used, and thought that although it did not cover so well as white lead, yet, taking this deficiency into account, the price at which it could be made would compensate for the defect. He had calculated that three coats of zinc paint would be equivalent to two coats of lead paint.

Mr. Hooper remarked that oxide of zinc paint was at present sold in London, and he believed the oxide of zinc used in making it was imported from abroad. This, at least, he knew to be the case with the paint prepared at one manufactory.

Mr. Scanlan had been engaged some years ago in some experiments on the preparation of oxide of zinc by combustion; his object having been to effect the oxidation by causing a current of hot air to pass over the surface of melted zinc. The results, however, had not realized his anticipations.

Mr. Bell had tried, in the preparation of zinc ointment, some of the oxide of zinc made by combustion as a substitute for that made in the usual way by precipitation and calcination, but found that in the state in which he had received it, it was not sufficiently smooth and impalpable. It required to be treated by elutriation before being used, so as to remove any minute particles of metal that might remain mixed with it.

Mr. Redwood thought that some benefit would result from the discussion of this subject, by its affording an opportunity for again directing the attention of the retail Pharmaceutist to the impurity of much of the oxide of zinc of commerce. He (Mr. R.) had read a paper before the Society some years ago on this subject, the object of which was to show that nearly all of what was met with in commerce and used in medicine as oxide of zinc was either carbonate of

zinc or basic sulphate of zinc, containing only from 64 to 67 per cent. of the oxide. Since that period manufacturers had prepared the true oxide of zinc according to the Pharmacopœia; but he was given to understand that in a great majority of cases the retail Pharmacutists still purchased the impure preparations, either on account of their being cheaper, or because the colour and appearance is more in accordance with what they had been accustomed to. The oxide of zinc made according to the Pharmacopœia has a slightly yellowish colour, while the other preparations are white.—*Trans. of the Lond. Pharmaceutical Society.*

ART. XXXIV.—ON GOUT PAPER.

By M. Buchner.

Michaleskul's gout paper is thus prepared: Three drachms of gum euphorbium and six drachms of cantharides, are powdered and digested with four ounces of spirit of wine of ninety per cent., and three drachms of Venice turpentine are then added. Fine paper is then to be dipped into this tincture and dried in the air. At Jassy, this paper is sold under the name of "*Papier Faiard*," or "*Papier Schemik.*" According to Mohr's *Pharm. Univ.*, four drachms of cantharides and one drachm of gum euphorbium are to be digested with five ounces of highly rectified spirit of wine: to the filtered liquid are added one and a half ounces of Venice turpentine, and two ounces of resin. These being melted together, and mixed with the tincture, are to be spread thinly on the paper whilst warm. According to the *Wurtemberg Pharm.*, one and a half ounces of euphorbium, and the same quantity of cantharides, are digested with four ounces of highly rectified spirit of wine for eight days, and the tincture then melted with seven ounces of pitch, three ounces of resin, three drachms of turpentine,

and two and a half drachms of linseed oil, and the spirit of wine evaporated. The residue is to be applied, by means of a plaster-machine upon well-sized paper. According to the *Codex Med. Hamburg.*, the euphorbium is omitted; four drachms of cantharides are treated with four ounces of alcoholised ether, two ounces of elemi, one ounce of balsam of tolu, one drachm of balsam of Peru dissolved therein, and then mixed with three ounces of resin and one and a half ounces of Venice turpentine. The mixture is to be heated till the spirit is evaporated, and when it has acquired the consistency of treacle, it is to be spread on paper. The *Baden Pharmacopœia*, substitutes resin of mezereon for the cantharides and euphorbium. It is obtained by means of highly rectified spirit of wine from mezereon bark, and is purified by ether. Twenty-four grains of this resin are to be mixed with four ounces of lard, six drachms of white wax, and four drachms of spermaceti, and the whole melted together. Paper is to be coated with it three times. According to Cerutti, the paper is to be spread over with a mixture of pitch, resin, wax, and turpentine. The new *Pharm. Boruss.*, of 1826, prescribes the preparation of a *charta resinosa*, by spreading pitch on paper.—*Pharmaceutisches Central-Blatt, June* 24, 1848.

ART. XXXV.—PASSAGE OF HYDROGEN THROUGH SOLID BODIES.

M. Louyet states, that if a current of hydrogen gas emanating from a capillary orifice, be directed against a sheet of paper, held a few milimetres from the orifice, so that the current be perpendicular to it, the paper is traversed by the gas. But the gas is not sifted through, as might have been expected; it passes as a current, and may be inflamed behind the paper as though nothing intervened between the

gaseous current and the ignited matter; and further, spongy platinum becomes incandescent behind the paper, in the path of the current, if the paper be three or four centimetres from the orifice, provided the metal is placed against the paper, or, at least a very slight distance from it. The pressure under which the phenomenon is produced does not exceed from ten to twelve centimetres of water. To my great surprise, M. Louyet adds, I have established that hydrogen gas traverses with equal facility gold leaf and beaten silver. Thus surround spongy platinum with several folds of gold or silver leaf, and direct against it a current of hydrogen, the platinum will become incandescent, and the gold or silver will adhere to its surface. Behind leaf tin also, spongy platinum is, in like manner, strongly heated. Through a thin membrane of gutta percha, such as is obtained by evaporating a slight layer of it from a solution in chloroform, hydrogen likewise passes; but hydrogen gas does not sensibly pass through pellicles of blown gas, however thin they may be.—*Literary Gazette.*

ART. XXXVI.—ON A NEW COMPOUND OF BORACIC ACID WITH SODA, AND ON THE PROBABLE MODE OF FORMATION OF BORACIC ACID.

By Dr. P. Bolley.

I was led to this inquiry from having frequently observed that, on mixing solutions of borax and chloride of ammonium, ammoniacal gas is disengaged. This fact, of which I could find no mention in any work, probably from its apparent unimportance, may be explained in two ways, either an exchange of bases and acids may take place, and borate of ammonia and chloride of sodium be formed from

borate of soda and chloride of ammonium, and the borate of ammonia parts with ammonia even at a low temperature like other ammoniacal salts (that it is decomposed at a high temperature, with elimination of ammonia, is well known;) or the chlorine of the sal-ammoniac may deprive the borax of a part of its soda, forming a corresponding amount of chloride of sodium, ammonia being thereby liberated, while with the remainder of the soda a salt might be formed with a larger amount of boracic acid. It seemed to me worth the trouble to ascertain which of these suppositions was true; for if the latter happened, we might expect to obtain the long-missed quadriborate of soda on employing the two bodies in suitable proportions. The following are the salts of boracic acid with soda known at present:—NaO, BO^3; $NaO,2BO^3$; $NaO6BO^3$. There are evidently some members missing in this series.

Chloride of ammonium was mixed with crystallized borax in the proportion of 2 equivs. of the latter to 1 of the former; the whole being dissolved and boiled as long as ammoniacal vapours were given off. The solution was then filtered and very gradually evaporated. This experiment was frequently repeated, but each time the same evil occurred, that the first crop of crystals were borax; and on further evaporation, if the temperature had been somewhat too high, the solution became syrupy and deposited no more crystals. But on very slow evaporation, some crystalline crusts separated at the bottom and on the surface, which agreed in their external characters and in their chemical reactions. After being rinsed with water and recrystallized once, they were obtained nearly free from chlorine; the mother liquor always contained a large quantity of chloride of sodium. These crusts were very hard, milk-white or vitreous, shining, and presenting upon the surface an agglomerate of minute intimately-adherent crystals, but exhibiting on fracture a radiate structure. They contain much water, which escapes on the application of heat, without,

however, puffing up so much as borax. The crystals dissolve in from 5 to 6 parts of water at the ordinary temperature. This solution furnishes, even with dilute sulphuric or nitric acid, white granular precipitates, consisting of boracic acid. This behaviour alone would prove that the mass was no mixture of borax with free boracic acid; for in a saturated solution of borax, made at the ordinary temperature, an addition of acid does not eliminate any boracic acid; on the contrary, the latter is more soluble in water to which some acid has been added than in pure water. The solution of the crystals has no action upon tumeric or litmus paper; whilst an ordinary solution of borax, as also a solution of boracic acid, turns tumeric paper quite brown.

The analysis of the salt, by decomposition in a platinum dish with recently prepared hydrofluoric acid, addition of sulphuric acid, and determination of the sulphate of soda, gave the following results:

Soda,	17.60	17.35	16.44	1	18.23
Boracic acid	82.40	82.65	83.56	4	81.77

The amount of water which the powdered salt lost over sulphuric acid was 32.36, 34.0, 34.5, 34.99 per cent., which corresponds to

	Calculated.	Found.
1 equiv. soda, ...	11.92	11.50
4 equivs. boracic acid, .	53.46	53.88
10 equivs. water . .	34.61	34.61

The solution of the salt furnished precipitates with all those saline solutions with which a solution of borax yields precipitates; they do not differ in colour and solubility, and have also that in common, that on washing the precipitates furnished by heavy metallic oxides, the amount of boracic acid diminishes very considerably.

I shall now give my view respecting the formation of native boracic acid and of sassoline, which I consider to be very simple and in perfect conformity with nature. I ex-

plain the formation of boracic acid from the behaviour of borax towards chloride of ammonium.

Among recent chemists, Payen has especially devoted attention to the formation of native boracic acid. As is well known, it has hitherto only been found in Tuscany, in the neighbourhood of Sienna, near Castelnuovo and Sasso, and on the island Volcano; in both places in a volcanic district, and at both localities accompanied with hot vapours which rise from the earth. Payen explains the formation of the boracic acid by assuming that strata of sulphuret of boron occur at some depth, which are decomposed by the percolating water of the ocean, producing boracic acid and sulphuretted hydrogen. Part of the boracic acid sublimes, forms precipitates, and reaches the lagoons; part of it decomposes the salts contained in the sea water, and the carbonate of lime of the rock thereby liberating carbonic and muriatic acids, &c. This is one hypothesis founded upon another; it assumes the existence of a substance, sulphuret of boron, which has never been found hitherto; and the possibility of its being formed in nature, to judge of its artificial preparation, presupposes a rare coincidence of favourable conditions.

I have found that boracite and datolite, which are borates of magnesia and lime, behave precisely like borax towards chloride of ammonium, liberating ammonia. But there are several minerals besides these and tinkal which contains boracic acid, for instance tourmaline, axinite, &c. Now, in a volcanic district, where the occurrence of native sal-ammoniac is quite usual, it merely requires the presence of any such mineral, and the conditions requisite for the production of boracic acid are given. When an excess of chloride of ammonium is present, the borax is entirely decomposed into chloride of sodium and boracic acid; and the same is undoubtedly the case with the other compounds of boron. The ascent of the boracic acid with the hot vapours is readily explained, from the known property of

this acid of being volatilized from aqueous or alcoholic solutions with the vapours of these liquids. The occurrence of ammonia, observed by Payen, in the vapours collected by him at Monte Rotundo, in Tuscany, where native boracic acid occurs in such abundance, greatly favours the view that the boracic acid of the lagoons is formed in the manner above indicated.—*Chem. Gaz. from Liebig's Annalen.*

ART. XXXVII.—ON LINIMENTUM SAPONIS.

By Mr. W. A. Hallows.

When recently making *linimentum saponis*, I could not help feeling surprised that the Pharmacopœia should for so many years have contained a formula for this preparation from which it cannot be made in the state in which it is required for use. Soap liniment or opodeldoc is always prescribed by medical men, under the impression of its being a liquid; and the public are so accustomed to use it in this form, that if it were offered them in the solid state, it would be rejected as useless, or inconvenient for application. Yet, when made according to the instructions of the Pharmacopœia, it becomes solid, and retains that condition in all states of the atmosphere. This fact has been noticed by some of the commentators on the Pharmacopœia, and has been alluded on more than one occasion in the *Pharmaceutical Journal.* In bringing the subject before this meeting on the present occasion, my principal object has been to call the attention of the College of Physicians, who are said to be now engaged in preparing a new Pharmacopœia, to the defects in the formula alluded to. It is much to be regretted that any formula should be admitted into the Pharmacopœia without being previously tested by competent judges, for in a case like that under notice, when the product obtained in accordance with the prescribed

instructions, is inapplicable for the purposes for which it is intended, the pharmaceutist has no alternative but to deviate from the instructions to such an extent as to fulfil the intentions of the prescribers. He is thus forced to break through what ought to be a rule of uniform obligation, namely, that all medicines used in dispensing, should be prepared faithfully according to the Pharmacopœia.

With the view of ascertaining what is the least amount of deviation from the prescribed formula by which a fluid opodeldoc may be obtained, I made two or three experiments, of which the following are the results:—

1. In the first place, I prepared a specimen of soap liniment exactly according to the Pharmacopœia. The soap used in the process was the best white Marseilles soap, and to be satisfied that this agreed with the definition of "Sapo" in the Pharmacopœia, part of the specimen used has been subsequently examined, and found to be a pure soap made form oil and soda. The formula of the Pharmacopœia is as follows:—

"Take of Soap,	℥iij.
Camphor,	℥j.
Spirit of Rosemary,	f℥xvj.

Dissolve the camphor in the spirit; afterwards add the soap, and macerate with a gentle heat until it is dissolved.

The product obtained is a firm jelly, which cannot be poured out of a bottle without melting it by heat. A specimen of it, labelled No. 1, is placed on the table for comparison with other specimens of it about to be described.

2. The specimen No. 2 has been prepared by dissolving as much oil of rosemary as would be contained in spirit of rosemary made by distillation according to the Pharmacopœia, in thirteen ounces of rectified spirit, and to this one ounce of camphor was added. Then three ounces of soap, previously scraped, was melted in three ounces of water by the aid of a gentle heat, and mixed with the alcoholic solution. The only material deviation in this process consists

in the substitution of three ounces of water for a similar quantity of spirit. It will be observed, however, that the soap is not kept perfectly in solution.

3. Another specimen, No. 3, was prepared in the same way as the last, but substituting four ounces of water for four ounces of the spirit, and this retains its fluid condition. The formula by which this is made will stand thus:—

Take of Soap, ℥iij.
Camphor, ℥j.
Rectified spirit, f℥xij.
Oil of Rosemary, ♏xij.
Distilled water, f℥iv.

Dissolve the camphor and the oil of rosemary in the spirit, then dissolve the soap in the water with a gentle heat, and mix the two solutions.

I think it would be an improvement in the formula to increase the quantity of oil of rosemary to half a drachm or a drachm.

In the above process, I have used a solution of oil of rosemary in spirit for the spirit of rosemary in the Pharmacopœia. The College directs spirit of rosemary to be made by mixing together oil of rosemary, rectified spirit, and water, and then distilling off a quantity equal to the spirit used. The product will, of course, consist of the spirit and the volatile oil, which pass over, leaving the water behind. Now, I would query whether this and some of the other spirits which are now directed to be made by distillation, would not for all practical purposes be as good if the essential oil was merely dissolved in the spirit and the distillation omitted. The only advantage that can result from distillation when essential oil is used, is that by this means any non-volatile constituent of the oil is rejected, and in the cases of those oils which become resinified by exposure to the air, the product may be somewhat more pure where distillation has been adopted; but oil of rosemary and oil of lavender do not become resinified to any appreciable extent, if care-

fully kept; and I am inclined to think that the spirits made from these oils are quite as good, and the process for making them is certainly much more simple and easy, when the oils, in the best state in which they can be met with in commerce, are merely dissolved in the spirit. Spirit of lavender is directed, in the Pharmacopœia, to be distilled from the lavender flowers, while spirit of cinnamon and spirit of rosemary are ordered to be made by distillation with the essential oils. I should conceive that spirit of cinnamon ought to be distilled directly from the cinnamon-bark, because the oil of cinnamon is very liable to become oxidized, and in this state it acquires very altered characters; but spirit of lavender would be generally better when made by dissolving the best commercial oil of lavender in spirit, than by distilling the flowers obtained from the herbalist. I am informed by a gentleman of considerable experience that the average quantity of essential oil of lavender, equivalent to two and a half pounds of the flowers (the quantity ordered in the formula of the Pharmacopœia for one gallon of the spirit) is ʒiij, grs. xxix. It would be a great advantage to those Pharmaceutists who are not provided with the arrangements for the distillation of spirits, or who are not allowed to conduct such processes by the regulations of the insurance offices, if they could make such preparations as compound tincture of lavender and compound camphor liniment, by mere admixture and solution of the ingredients.—*Pharmaceutical Journal.*

ART. XXXIX.—ON THE PREPARATION OF BISULPHURET OF CARBON.

By M. Chandelon.

The numerous applications which have recently been made of bisulphuret of carbon have rendered it important

to ascertain the best method of preparing this compound abundantly and economically. The apparatus used for this purpose consists of a cylinder of cast iron, eight inches in diameter and twenty-eight inches long. This cylinder is permanently closed at one end, and furnished with a cover, which is screwed on at the other end. Through the latter an iron tube, two inches in diameter, passes to near the bottom of the cylinder: this tube is furnished with an iron stopper at its upper extremity. There is also a wide tube connecting the top of the cylinder with a suitable refrigerator, and the lower end of the condensing tube of the refrigerator is inserted into the mouth of a bottle containing some water.

The iron cylinder is filled with wood charcoal, and is then placed in a suitable furnace; when it has acquired a dull red heat some pieces of sulphur are introduced through the tube, which is then immediately closed with the stopper. The sulphur is converted into vapour, which passing over the red-hot charcoal, combines to form the bisulphuret of carbon, and this is condensed in the refrigerator and collected in the bottle of water. With six pounds of charcoal and twenty or thirty pounds of roll sulphur, ten pints of the crude bisulphuret may be made in the course of six or seven hours.—*Ibid, from Journal de Pharmacie.*

ART. XL.—ADULTERATION OF CREAM OF TARTAR.

By Mr. James Grant.

I beg through the medium of the *Pharmaceutical Journal*, to call the attention of Chemists and Druggists to the adulteration of powdered cream of tartar, as it is, I believe, one of those articles which, from its cheapness, &c. is generally supposed not to be worth sophisticating. A specimen obtained from one of the most respectable wholesale drug-

gists in London yielded, in 100 grains, 8½ grains of sulphate of lime (gypsum.)

As cream of tartar is the source to which the chemical student is generally referred for pure carbonate of potash, the exposure of this fraud becomes doubly important.—*Ibid.*

ART. XLI.—COLLODION AS A COATING FOR PILLS.

By Mr. E. H. Durden.

I find that collodion may be usefully employed for coating pills; for this purpose the pills may be placed on the point of a fine pin or needle, and dipped into the solution of gun cotton. The solution I used had a sp. gr. of 0.810, and I found two dippings gave a perfect coating. An aloetic or colocynth pill thus covered may be placed on the tongue, and no taste experienced of the bitter ingredients entering into its composition. Its medicinal effect is not interfered with. Solutions of gutta percha in chloroform, and bisulphuret of carbon, effects the same purpose, but the collodion is preferable.—*Ibid.*

ART. XLII.—METHOD OF DETECTING THE FLOUR OF INDIAN CORN IN THAT OF WHEAT.

By M. Mauviel la Grange.

The sample is sifted, and 2 grms. of the finest flour mixed in a test-tube with four grms. of nitric acid, and well stirred with a glass rod. After this add 60 grms. of water, and then 2 grms. of carbonate of potash dissolved in 8 grms. water. When no Indian corn is present, as soon as the carbonic acid has escaped, only yellowish flakes separate ;

but when any Indian corn is present, some orange-yellow particles subside, which are easily detected. In this way an admixture of from 4 to 5 per cent. of Indian corn with wheaten flour may be detected.—*Journ. de Chem. Méd.*

ART. XLIII.—EXPERIMENTS ON SENNA AND ARGOL LEAVES.

By Heberlein.

According to Heberlein, spirit of wine extracts from senna leaves only chlorophylle and extractive matter, the *cathartine* of Lassaigne and Feneulle, which does not, however, possess in the slightest degree the purgative effect ascribed to it by these gentlemen; for after repeated experiments with smaller quantities, the alcoholic extract of one and a half ounces of folia sennæ were taken without any effect. The uselessness of treating senna-leaves with spirit of wine, and the inefficacy of tinctura sennæ are therefore obvious. The aqueous extract of four drachms of senna-leaves, which had first been exhausted by spirit of wine, effected evacuations with griping; so that the griping principle had not been removed by the spirit. The leaves used for these experiments were those of Tripoli senna, which are quite free from the leaves of *Cynanchum Arghel.* The latter, which are found among the Alexandrian senna, are in bad favour among physicians, but without just grounds, for experiments made with the picked leaves of *Cynanchum Arghel* showed them to be harmless. An infusion of two and a half drachms produced no effect or inconvenience.—*Pharm. Jour., from Pharmaceutisches Central-Blatt.*

ABSTRACT FROM THE MINUTES OF THE PHILADELPHIA COLLEGE OF PHARMACY.

At a Stated Meeting of the College, held at the Hall of Pharmacy, Third month 27th, 1847—Present 18 members. President in the Chair. The minutes of the Board of Trustees were read and approved. Through them the College is informed that Charles Bullock, a graduate of the College, has been elected a resident member.

The Committee appointed on the adulteration of drugs, verbally reported that they had given further attention to the important matters submitted to them, and were continued.

The Committee on the Code of Ethics, &c., reported through its Chairman that no further conference has been had with the Committee of the College of Physicians, in consequence of their not having been called together by the Chairman of that body, as was agreed upon in their last interview.

The proposal to alter law 5th, sec. 2d, referred from the last meeting to the consideration of this, was freely discussed, and on motion referred to the next stated meeting.

The Committee on Latin Labels reported that the present edition is nearly exhausted, and that there is a sufficient sum in their hands to publish another edition. On motion of Samuel F. Troth, it was Resolved, that the Committee be authorized to publish a second edition, if in their judgment it is best to do so.

The following report of the Committee on the Sinking Fund, was read and directed to be placed on the minutes.

"The Committee on the Sinking Fund report that since their appointment in the fall of 1846, they have received the following amounts, viz :

16*

From the committee on Latin Labels, . .		$350.00
" " Publication Committee, . .		100.00
" " Tax on Professors, . . .		177.84
" " Sale of Patent Medicine Directions		146.55
		$774.39
With which they have had an edition of Patent Medicine Directions printed, the cost, including paper, printing, &c., amounts to	$360.80	
They have also purchased $500 of the College loan for . . .	370.00	
		730.80
Leaving a balance in the hands of the Committee of		$43.59

Samuel F. Troth,
Warder Morris,
Joseph C. Turnpenny,
Committee."

The following resolution, offered by Samuel F. Troth was, on motion, adopted, and the Secretary was directed to transmit a copy to Professor Wood.

Resolved, That the thanks of the Philadelphia College of Pharmacy be presented to Dr. Geo. B. Wood, for the liberal manner in which he has relinquished to the Committee on the Sinking Fund for a small compensation, all his interest in the loans of the College.

The following report from the Publishing Committee was read and directed to be placed on the minutes. Accompanying the report, a statement of receipts and expenditures for the past year was submitted, from which it appears that there is a balance in their hands of three hundred and seventy-four dollars, subject to a bill for printing No. 2 of the present volume of the Journal of Pharmacy:

To the Philadelphia College of Pharmacy.

"The Publishing Committee respectfully report that the duties of their appointment have been attended to. The Editors, by additional exertion, issued five numbers within the year 1848, by which means the work has been made to date its commencement with the January number, and a fruitful cause of confusion removed. The proprietors of Carson's Medical Botany having offered to furnish lithograph plates from that work, at a moderate price, the Journal has been embellished with several of them accompanying articles on subjects of the materia medica. The second number of the twenty-first volume is now in progress, and will be issued about the usual time in the first week of April. The finances of the committee will be exhibited in the annexed statement of its accounts. All of which is submitted by

D. B. Smith,
Chas. Ellis,
Robert Bridges,
Edward Parrish,
Joseph Carson,
Wm. Procter, Jr. } Editors. } Committee."

This being the usual time for the annual election of officers of the institution, the College proceeded to the election, and the Chairman appointed Alfred B. Taylor and Jacob L. Smith, tellers, who reported that the following named members had received a majority of votes, whereupon they were declared duly elected to the respective offices.

President.
Daniel B. Smith.

1st Vice President.
Charles Ellis.

2d Vice President.
Samuel F. Troth.

Treasurer.
Joseph C. Turnpenny.

Secretary.
Dillwyn Parrish.

Corresponding Secretary.
William Hodgson, Jr.

Trustees.

Warder Morris,
William Procter, Jr.
Joseph Carson,
Robert Bridges,
John H. Ecky,
Edward Parrish,
William P. Troth,
John Harris.

Publishing Committee.

Robert Bridges,
Edward Parrish,
Charles Ellis,
Daniel B. Smith.

Committee on Sinking Fund.

Warder Morris,
Samuel F. Troth,
Joseph C. Turnpenny.

Then, on motion, adjourned.

DILLWYN PARRISH, Secretary.

DEATH OF BERZELIUS.

This distinguished chemist, the father of analytical chemistry, expired on the 7th of Aug., 1848, at Stockholm. Baron Berzelius was born on the 20th of Aug., 1779, in Ostergöthland, in Sweden, of a respectable family. At the age of seventeen he entered the University of Upsala, where he made a rapid progress in his studies, particularly in his favourite science—Chemistry; after passing the necessary examinations, he received his diploma of Doctor in Medicine in 1804, and was appointed Medicinæ et Pharmaciæ Adjunctus at the Collegium Medicum at Stockholm, and gave instruction in chemistry to young students, and on account of his small income, was obliged to practice occasionally as a physician. In 1807 he was appointed Medicinæ Pharmaciæ Professor; and in the same year he instituted, in conjunction with seven other eminent men, the Swedish Medical Society at Stockholm, now a flourishing institution, and constituting the very heart of the medical profession in Sweden.

In 1808 he was made a member of the Royal Academy of Sciences, in 1810 officiated as President, and in 1818 as Perpetual Secretary. On the occasion of holding this appointment for a quarter of a century, a dinner was given in the Academy by the members to this distinguished *savant*, which was presided over by his present Majesty, then the Crown Prince, who on proposing the health of Berzelius, expressed his grateful acknowledgment of his own obligations to Berzelius for the valuable private instruction he had received from him in his younger days. In the same year he was appointed a member of the Royal Sanitary Board, of which, at the time of his death, he was the senior member. As a proof of the magnitude of his laborious pursuits, it may be sufficient to mention that he first developed the electro-chemical system, and that he has also examined

and minutely described the atomic theory of the elementary bodies. He discovered and examined several great classes of chemical combinations, as, for instance, the different degrees in which sulphur combines with fluoric acid, with platinum, columbium, vanadium, tellurium, and phosphorus, the sulphates, &c. In organic chemistry he has no less distinguished himself by his experiments, and, properly speaking, he has laid the foundation of vegetable and animal chemistry, more particularly the latter. As regards chemical analysis, the highest merits are due to him, for having arranged a new and generally adopted chemical nomenclature. His works, which have been for the most part translated into the English, French, German, Italian, Spanish, and Polish languages, are so numerous and voluminous, that, considering the accuracy with which every thing is described, it appears to be almost a wonder how one man, whose time, besides, is occupied with a great amount of official duties, has been able to accomplish such a mass of scientific publications.

Berzelius had received from his Majesty King Charles John many marks of high distinction: he was created a nobleman in 1818, a Baron in 1835, Knight Commander of the Royal Order of Wasa in 1821, and Grand Cross of the same order in 1829; he was a Knight of the Royal Swedish order of the Polar Star, and of several foreign orders received from the Emperor of Russia and the Kings of Prussia, Denmark, Belgium, France, and Sardinia; an honorary member of upwards of one hundred literary and scientific societies. In consideration of the great services which Berzelius has bestowed on his native country, the members of the Diet at Stockholm in 1840, voted to him the annual sum of 2000 dollars banco as a pension for his lifetime independent of his former emoluments.—*Lancet.*

Editorial Department.

Our readers will notice the report of Dr. Edwards on the working of the Law against the admission of adulterated and deteriorated drugs and chemicals, in the contents of this number. We cannot avoid feelings of gratulation in observing the success which has thus far attended this novel experiment, and hope that it augurs favourably for the introduction of further reforms in relation, not merely to the importation of bad drugs from foreign parts, but to their existence and sale within the limits of our own country. The general government has nobly done its part—it remains for the State legislatures and Executives to look into this important subject and ascertain what there is for them to do, that will benefit the public interests over which they are appointed to watch. We are fully impressed with the grave difficulties that present themselves in an approach to the reformation hinted at. The spirit of free trade which pervades our people, and which induces a jealous watchfulness over every movement that in the slightest degree really or apparently invades their assumed rights, is in opposition to any laws which tend to place the practice of Pharmacy exclusively in the hands of the regularly educated. It is well known that the existing laws relative to the practice of Medicine have but little influence in frowning down the inroads of quackery; empirics flourish, become wealthy, and occupy positions of respectability in public opinion; and so great is the tendency in the general mind to be cured in a marvellous manner, that it has been remarked that those regular practitioners who have not scrupled to humour this weak side of the community, have succeeded far more rapidly in acquiring a practice, and consequent wealth, than their more conscientious brethren.

It will be a source of deep mortification to the friends of medical reform, if the vile practice of drug adulteration, which we have supposed to be chiefly confined to the foreign trade, shall now flourish within our own limits,—that the skill and imitativeness proverbially characteristic of the Anglo-American shall be turned to the base purposes of fraud in drugs. There are no other means of guarding against this nefarious practice, save those that arise from confining the distribution of drugs to the consumer, in the hands of the qualified; so long as herbalists, grocers, and general store keepers can vend not only drugs, but active and important pharmaceutical preparations, of whose composition and strength they are ignorant, and of whose qualities they are unable to judge, there is a ready market for adulterations. The phrase "good enough for the West," will be replaced by

"good enough for the ignorant," and those who acknowledge the grocer and general dealer as their pharmaceutists, whether in east or west, north or south, will, to a large extent, become the willing consumers of trashy and deteriorated medicines.

We earnestly hope that every pharmaceutist, who feels the least interest in the advancement of his profession, will so far contribute to the general good, as to watch the drug-market closely, and expose every attempt at fraud that may come under his notice. We shall willingly second the endeavours of such, by opening our pages to their communications, for we believe much good may be done in this individual way.

The Code of Ethics of the Philadelphia College of Pharmacy, was communicated to the American Medical Association, which met in May last, by one of the Committee having charge of its distribution, and it affords us pleasure to state, that it was inserted entire in the first volume of their Transactions for the year 1848.

We omitted, in our last number, to acknowledge the receipt, via express, of a specimen of purified cod-liver oil from Mr. Emery Souther, of Boston, which we now do. In comparing this oil with that of a similar character then in the market, we find it fully equal in appearance and freedom from fishy odour; but more recent importations into our market have possessed sensible qualities less calculated to offend the taste of the patient. We hope that the advantages possessed by the Bostonian Pharmaceutists in procuring the recent livers of the cod, will induce them to resort to every means afforded by the most enlightened manipulation to extract this oil as free from nauseous properties as possible. The fishy odour is acquired by the most carefully prepared oil, by exposure to the air and heat; and it is presumable that the quicker the process, the more gentle the heat used, and the more completely the oil is excluded from the air after preparation, the better and milder will be the product obtained. The reader is referred to an interesting article by Dr. Pereria on cod liver oil in this number.

We have to acknowledge the receipt, from Mr. Campbell Morfit, author of "Chemical and Pharmaceutic Manipulations," of a copy of his sheet of labels for "the test series." We are informed that the ink used in printing these labels, is not liable to be effected by acid vapours in the laboratory; if as much could be said for the paper upon which the ink is laid, the chemist would have additional cause to thank Mr. Morfit for this contribution to the fittings of his laboratory.

THE

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JULY, 1849.

ART. XLIV.—NOTE UPON INDIA OPIUM.

By J. Carson, M. D.

Through the kindness of Dr. Ruschenberger, U. S. Navy, a few samples of drugs have been added to our cabinet, which from their rarity or interest, are worthy of notice in the Journal of the College of Pharmacy. The specimens were obtained by Dr. Ruschenberger during his late visit to Canton as fleet Surgeon of the East India squadron.

India Opium.

Three kinds of this opium have come into our possession, which will be noticed in succession. The first of these is,

Patna Opium.—The form of this kind is a round ball, resembling a cannon ball, rough and brown externally, five and a half inches in diameter; the weight is three pounds, nine drachms. The exterior coating is composed of the petals of the poppy closely matted together, forming a firm, compact, resisting case, varying in thickness from half to three quarters of an inch. It is perfectly dry, and almost impervious to moisture. The cavity formed by this coating is entirely filled with opium. This has the consistence of a soft

pilular mass—perfectly homogeneous, of a black color, and when presenting a smooth surface, of a shining aspect. It is sticky, tenacious and ductile. When exposed for a short time to a warm atmosphere, it hardens on the surface; a thin lamina is translucent. The odor is peculiar, oppressive and rank, more like the fresh heads of the poppy, and the taste is bitter. If exposed to the atmosphere in a damp place, mould is soon formed upon the surface, which also from the absorption of moisture, will remain soft. It is very adherent to the fingers and dries with difficulty.

Upon first placing a portion in water, it assumed a lighter or brown tint, and became spongy on the surface; it finally disintegrated, leaving a brown granular deposit, and gave to the water a deep brown color. Examined with the microscope, the deposit was found to consist of a large quantity of aciculæ, broken crystals, and an amorphous granular substance with membranous patches. With boiling water, a deep blackish-brown solution was formed, from which crystals were deposited, of a beautiful arborescent character. When this solution was filtered, on the filter was left a tenacious gum-elastic-like substance. From Prof. Procter, I have obtained the following statement with respect to the amount of morphia found in it.

100 grains of soft Patna opium from the interior of the mass was treated with water until exhausted. The residue weighed 50 grains, after having attained a consistence drier than the original opium, but not entirely dry. The infusions were united, evaporated to one fluid ounce, and mixed with half an ounce of alcohol; a slight excess of ammoniated alcohol was added, and the whole left for twenty-four hours. The crystals were collected on a filter, washed with water, and when dried, weighed 6.75 grains; they were of a brown color. When these were treated by ether, at several times until exhausted, they lost 1.75 grains, and the ethereal solutions yielded by evaporation a crystalline residue, coloring nitric acid yellow.

This was narcotina with codeia probably mixed, leaving as the weight of the morphia, 5 grains.

The second variety is *Benares Opium.*

This is also in the form of a round ball, weighing three pounds, ten drachms. Its size is the same as the preceding, and so far as sensible peculiarities are concerned, presents the same as in the preceding kind. I found the same sepa-tion to take place—when macerated in water—between the crystalline meconate of morphia, and the other constituents in an amorphous or granulated form. The resemblance is so complete between the two kinds of opium, that I fully accord in the statement of Dr. Pereira, that they are not to be distinguished.

The experiments of the same gentleman, conducted as in the case of Patna, exhibited 48 grs. for residue, 7 grains of crystals, much discolored, and losing 1.5 grs. by ether, the resulting morphia, therefore, when dry, being 5.5 grains in weight.

The third kind is *Malwa Opium.*

This is in the form of a flattened lenticular mass, apparently round originally, and assuming this form from compression, the weight is ten and a half ounces, it has a rough rugose appearance externally, is covered with a brownish dust, which has insinuated itself into the rugæ, and is closely adherent, here and there are to be found the remains of some leaf, which must have been loosely applied, as well as fragments of paper. The surface has an unctuous feel. The consistence is solid; it breaks with a short rough fracture, and presents a blackish-brown color, here and there showing oily, irregular spots. Its taste is very bitter and acrid, and the odor highly narcotic. When macerated in water, the color communicated is deep-brown. When the finer particles of sediment are examined by the microscope, they present crystals of meconate of morphia.

The exterior of this kind is also very liable to become mouldy.

This variety was also tested by Mr. Procter, with the following results:

100 grains of best Malwa Opium yielded to water 66 grains; the residue dried, weighed 34 grains. The treatment of the solutions was the same as in the case of Patna. The crystals weighed 13 grains; they were brown colored, and well defined. Treated with ether, brilliant acicular crystals were obtained, coloring nitric acid yellow, and not dissolving in solution of caustic potassa. The residue, constituted of morphia, weighed 9.25, leaving 3.75 as the weight of the product of the ethereal solution, or narcotina and codeia.

From the examination detailed, it would appear that the amount of morphia procurable from these samples of opium, is above what it has been found by other chemists in the same varieties. Dr. Smytten, in Transactions of the Medical and Physical Society, Calcutta, reports 2½ to 3 per cent. of morphia; this Pereira considered below the truth, which accords with Mr. Procter's results, viz. 5 per cent. for Patna and 5½ for Benares. Mr. Morson's estimate, that half the quantity of morphia is contained in Benares opium, when compared with the Turkey variety, will be nearly correct.

A variety of opium which is prepared with greater care, and which is called *Garden Patna Opium*, is referred to, both by Pereira and Christison. This was prepared first under the directorship of Mr. Fleming. It yields, according to Merck, 8 per cent. of morphia, but must, like all kinds, present more or less difference in the samples; thus Christison obtained from it 6½ per cent., while Dr. O'Shaughnessy procured 10 per cent.

Malwa opium, at one time, was regarded as inferior, but may now be considered the best of the Indian varieties; this is substantiated by the result of Mr. Procter's test, which afforded 9¼ per cent. Dr. Smytten obtained 7¾ to

8 per cent. This is very nearly the average of the best Smyrna Opium.

India opium is in so great demand in China, and commands so much higher a price than the Turkey, that little of it is sent to England, and hardly ever does it reach the United States. Although somewhat inferior in the amount of morphia, and therefore less suitable for the profitable manufacture of that article or its salts, it is said to be quite as active as a narcotic. From the mode in which it is made, and its freedom from adulterating admixture, it affords a larger amount of a clear or pure extract, which by the Chinese is used for smoking. The solubility in water is the great desideratum with them. The trade in India opium is a monopoly in the hands of the British East India Company, under the direction of whose agents all the varieties are prepared for sale. In Calcutta there are two sales annually. In the Journal of the Indian Archipelago, printed at Singapore, for January, 1848, is a paper by R. Little, Esq., Surgeon, on the Habitual Use of Opium at Singapore, from which I shall extract some statements with respect to the article under consideration.

"China, where at present it is extensively used, cannot be said to have indulged long in the vice; all the early writers on that country are silent as to its use except in medicine." "During the reign of the Emperor, Kien Sung, who reigned from 1773 to 1796, a tariff was regularly established, and the duty fixed at three taels for 100 catties, and two taels, four mace, and five candarines for fees. Previous to 1767, the number of chests imported did not exceed two hundred yearly. In 1773 the East India Company made their first venture in opium, and in 1796 it was declared a crime to smoke opium." In 1837—the consumption had reached 4000 chests.

"From the commencement of the hot season to the middle of the rains, the government is ready to receive opium, which is brought by the natives every morning, in batches

varying in quantities from twenty seers to a maund. The examining officer into each jar thrusts his examining rod, which consists of a slit bamboo, and by experience he can so judge of the qualities of the specimens before him, which are assorted into lots of No. 1 to No. 4 quality. Opium of the first quality is of a fine chesnut color, aromatic smell and dense consistence. It is moderately ductile, and when the mass is torn, breaks with a deeply notched fracture, with sharp needle-like fibres, translucent and ruby-red at the edges. It is readily broken down under water, and the solution at first filters of a sherry color, which darkens as the process proceeds. One hundred grains of this yield an extract to cold distilled water of from 35 to 45, and at the temperature of 212°, leave from 20 to 28 per cent., having a consistence of 80 to 72, the consistence of the factory."

"The second quality is inferior to the first, and the third quality is possessed of the following properties: Black, pasty. of a very heavy smell, drops from the examining rod, gives off from 40 to 50 per cent. of moisture, and contains a large quantity of "Pasewa;" while the fourth or last number embraces all the kinds which are too bad to be used in the composition of the balls, comprising specimens of all varieties of color and consistence. This number is moistened with water, and only used as paste to cement the covering of the balls. The three first qualities are emptied from their jars into large tanks, in which they are kept until the supply of the season has been obtained. The opium is then removed and exposed to the air on shallow wooden frames, until it becomes of the consistency of from 69 to 70, when it is given to the cake maker, who guesses to a drachm the exact weight, and envelops the opium in its covering of petals, cemented by a covering of quality No. 4. The balls are then weighed, and stored, to undergo a thorough ventillation and drying. Formerly the covering of the balls was composed of the leaves of tobacco; but the late Mr. Flemming introduced the practice of using the petals of the poppy,

which was such an improvement that the Court of Directors presented him with 50,000 rupees. The bales, forty in number, are packed in a mango wood case, which consists of two stories, with twenty pigeon holes in each, lined with lath, and surrounded by the leaves of the poppy. Sometimes these bales are so soft as to burst their skins, and much of the liquid opium running out is lost. In 1823, many of the chests of Patna lost 5 catties from this cause, and to this day we have the same thing continuing to occur, Patna chests are covered with bullock hides; Benares with gunnies.

In the year 1836 Dr. Butter published in the Journal of the Asiatic Society, of Bengal, Vol. v., a paper on the preparation of this kind of opium. From him we learn that the great object of the Bengal agencies is to furnish an article suitable to the peculiar tastes of the population of China, who value any samples of opium in direct proportion to the quantity of hot drawn watery extract attainable from it, and to the purity and strength of the flavor of that extract when dried and smoked through a pipe. The quality of the product must depend in a measure upon the soil, manuring and irrigation, &c., but there are circumstances which are of great importance in collecting and preparing the opium, upon which Dr. Butter dwells in extenso. The poppy juice at the time of collection should contain a minimum of water, that its reduction to the due degree of spissitude may be effected in the shortest time. A counteracting agent to this is the precipitation of dew on the surface of the capsule. "When a current of wind or a cloudy sky prevents the formation of dew, it is found that the scarifications made in the capsule about the middle of the preceding day, are sealed up by the slight oozing of the juice which had immediately followed the incision; and the quantity of opium obtained is small. When again the dew is abundant, it washes open the wounds in the capsule, and thus facilitates the flow of the milk, which in heavy dews is apt to drop off the capsule

entirely and be wasted. But when the dew is in moderate quantity, it allows the milk to thicken by evaporation, and to collect in irregular tears, a grain each." These tears are more consistent externally than internally, are rose-red outside and reddish-white within. They constitute *raw opium.* "In the collection of these drops of half-dried juice, it is very apt to get mixed with the dew, which in the earlier hours of collection continue to besprinkle the capsules, and which here does a double mischief, first by retarding the inspissation of the general mass of the juice; and secondly, by separating its two most remarkable constituent parts, that which is soluble, and that which is insoluble in water. So little aware or so reckless, even under the most favorable construction of their conduct, are the *koeris*, of the injury thus caused by the dew, that many of them are in the habit of occasionally washing their scrapers with water, and of adding the washings to the collection of the morning; in Malwa, *oil* is used for this purpose, to the irremediable injury of the flavor of the opium." On examining the juice mixed with water, it will be found to have separated into two portions; one consistent, containing most of the resin, gluten, caoutchouc, and other less soluble constituents, with part of the super-meconate of morphia, and a fluid containing gum, some resin, much of the super-meconate and coloring principle, which, pale at first, acquire a deep reddish or blackish-brown color.

Some *koeris* are in the habit of draining off the fluid portion, and selling it under the name of *paséwá*, for half the price of opium. It is used as a *lewa*, or paste, for the envelopes formed of petals. Others, after allowing the soluble principle to become thus changed into an acescent blackish, sluggish fluid, mix it up with the more consistent part of their opium, and sell the whole in a mixed state; as a consequence, they are subject to a penalty called *batta* upon *paséwá*, regulated by the estimate of the opium examiner, of the quantity of *paséwá* contained.

By proper management, opium of the spissitude of 70 per cent. can be obtained; the *grain*, or raw opium being procured, rubbed down and dried to that degree, which is standard. It is a common belief that opium must ferment, but when it does so it is owing to the excess of moisture. When the drug is very moist, or contains a larger amount of *paséwá*, it is placed in vessels perforated each with a hole, and allowed to drain.

Paséwá, in a pure and concentrated state, is a viscid, dark, reddish-brown fluid, transparent in plates. Its homogeneous physical constitution prevents its assuming to the eye that appearance of consistency which is presented by ordinary opium. In the former, all the ingredients are in a state of true chemical combination with the water contained, while in the latter, many of the ingredients are only in a state of mechanical mixture, a condition giving an appearance of solidity beyond all proportion to the actual quantity of solid matter contained.

The constituents of paséwá are in a state of chemical combination, and the slow addition of water will not subvert that condition. But the sudden affusion of a large quantity of water on concentrated paséwá, instantly resolves it into two portions, as before. To make lewa, the water therefore must be slowly added.

Pure opium is liable to the same resolution of its component parts, from the sudden affusion of water; if the latter be slowly added, and thoroughly mixed, the gelatinous opium will absorb it, forming a species of hydrate, and will retain its tremulous consistence, but if the water be suddenly added in considerable quantity, an immediate separation of the more and less soluble constituents occurs, and the opium loses its gelatinous and adhesive character. When opium is dried up to a certain point below the spissitude of 80 per cent. it loses the power of absorbing water without decomposition, and cannot be brought to the gelatinous state. It might be expected, that by adding 30 per cent. of water to

70 of dry opium powder, we could produce a combination possessing the consistence and other physical characters of fresh standard opium, but the compound has little consistence, and will be found to contain insoluble portions, which have lost their power of forming hydrates with water; yet its spissitude remains exactly that of standing opium, the precise quantity of dry opium employed on making it, being recovered from it, but in a darkened and deteriorated condition.

When the juice of the poppy has been properly dried, that is rapidly, in a cool shade, and protected from dust, it possesses, at the spissitude of 70 per cent. (this is 30 of water) the following properties: "It has in the mass a reddish-brown color resembling copper, (the metallic lustre obtuse;) and when spread thin on a white plate, shows considerable translucency, with a gallstone yellow color, and a *slightly* granular texture. When cut into flakes with a knife, it exhibits sharp edges, without drawing out into threads; and is tremulous-like jelly, or rather strawberry jam, to which it has been aptly compared. It has considerably adhesiveness, a handful of it not dropping from the hand inverted for some seconds. Its smell is the pure peculiar smell of opium, heavy and not unpleasant. In this condition it is said to be standard, or *awwal* opium."

When the juice again, instead of being thus exposed to the air, has, after collection, been kept in deep vessels, which prevent evaportion, it presents the following appearances. A specimen of it which has the spissitude of only 60 per cent., has the apparent consistence or substantiality of standard opium at 70 per cent. But on minuter examination, it will be found that the apparent firmness of texture is a deception, resulting from the mechanical constitution of the mass, it being made up with but little alteration of the *irregular drops* collected from the capsule, soft within and more inspissated without; this outer portion, as long as it remains entire, giving the general character of consis-

tency to the mass, just as the shells of a quantity of eggs would do. For when the opium is rubbed smartly in a mortar, the fictitious consistence disappears, and it is reduced to the proportion which it properly bears to standard opium. When opium thus retains the original configuration of the irregular drops, it is said to be *kasha* or *raw*. When these are broken down into the *minute grain* mentioned in description of standard opium, it is said to be pakka, or matured, whether the spissitude be 50 or 70 per cent." It is better to reduce this granular arrangement, and form a homogeneous mass, because the inspissation goes on much better; this, according to Dr. Butter, is against the prevailing opinion. In bringing opium to the standard spissitude, shallow vessels, and the removal of the top thickened crust are necessary. If opium is kept with much water, for the purpose of increasing its weight, or kept in a damp place, it becomes mouldy, ferments from the gluten in it, and its quality is impaired. If an attempt be made to draw off the water by boiling, the blackened and charred condition detects the operation.

To adulterate India opium sand, soft clayey mud, sugar molasses and cow dung, the pulp of the datura, and the mucilage of the quince are used. The last two are difficult of detection, if not added in quantity to affect the consistence and smell of the opium. Pounded poppy seeds are sometimes used. Oil was at one time largely mixed with Malwa opium.

I have liberally extracted from the paper of Dr. Butter, because it contains a larger amount of information upon the subject of India Opium, than any other published, and because it explains many facts in connection with the inherent nature and causes of difference in the qualities of the article which are obscure, and difficult of comprehension, except to one who has watched the process of making it from the first oozing of the juice to the assumption of the commercial form.

Through the kindness of Dr. James H. Bradford, for many years a resident of Canton, I am indebted for some notes, which were communicated to him by Capt. John Gover, formerly of ship Samarang, who had lived at Lintin fo rseveral years, as master and part owner of that opium ship, and who had paid particular attention to this extensive trade. The following experiments were made by Capt. Gover, in accordance with the Chinese mode of preparing opium for smoking.

Half a cake of Patna opium, weighing 26 oz., 19 dwt., troy, having 2 oz. 3 dwt., 9 grs. of the outermost part of the skin laid aside, was put into a very thin hemispherical brass vessel (capable of containing about 12.2 pints) with about six pints of spring water, and placed on a brisk fire. At first, the mixture was seldom stirred, but when rather more than half the water had been evaporated, the stirring by means of a wooden spatula was without intermission. When of the consistence of a soft extract, half of it was placed in another vessel exactly like the first, and the evaporation continued in the two vessels by placing them alternately on the fire. The fire was now considerably damped, by throwing over the charcoal the burnt ashes from below. The exsiccation was continued by spreading the mass over the inner surface of the pans, and within about an inch and a half of the rim, the thickness of one-fifth of an inch. The pans continued to be alternately upon the fire, and the surface was often changed by mixing the whole well with the spatula and carefully re-spreading. At length, the fire having been diminished to a very low state, and without smoke or flame, the pans were inverted for two or three minutes at a time, pressed with the fingers, to which it did not stick, and allowed for a few minutes to cool. Lastly, the masses were cut by means of a knife into lines similar to the meridional lines on a globe.

The exsiccation was now finished, the mass, after it had been allowed to cool, was broken up, and about eight pints of spring water added, and the whole allowed to remain at rest for twenty-four hours. Next day the cold infusion

was drawn off clear by means of a piece of thick cloth. This infusion appeared about the consistency of syrup. The remaining mass was quite soft, upon which about three pints of boiling water was poured, and the warm infusion allowed to remain about ten minutes. It was then filtered through Chinese paper with pressure.

By the time this had been accomplished, to the cold infusion, which had been placed over a brisk fire and had commenced to boil, the filtered infusion was added. The boiling was briskly continued, and a little scum was thrown up, which was removed by means of a feather. As the extract thickens, it was carefully stirred, and when the quantity of water was much reduced, the pan was placed on a smaller fire, and carefully stirred with three round sticks; from time to time it was removed from the fire, and a circular motion given to it. When it had attained the form of a thin extract, it was taken from the fire, stirred gently, and cooled by means of a fan, and placed in a jar for use. Its appearance was not unlike molasses, but rather of a reddish-brown colour. The scum was added to a small part of the water infusion, which had now dropped from the filter and evaporated to about the same consistency as the first part, but its color was darker and it was not of itself fit for smoking.

The residuum appeared nearly as dark as charcoal.—When dried to about the state of the original opium, it weighed 13 oz., 14 dwt., 23 grs.

The pure opium (first extract) weighed	9	18	0
The second extract weighed,	0	2	8
The outer shell weighed, . .	2	3	9
	25	18	16
Original weight of half cake,	26	19	0
Loss, ...	1	0	8

From an experiment upon the outer portion of cover by

spirit, about one-third in weight of extract was procured. The inner portion of the cover yielded 26 in 40 grains.

Our note upon India Opium has been extended beyond the limits we had in the first instance allotted to the subject; as we proceeded, however, so much information presented, not contained in systematic works, that we thought a full account would be interesting to the readers of the Journal.

ART. XLV.—NOTE UPON LINIMENTUM SAPONIS, L. E. D., TINCTURA SAPONIS CAMPHORATA, U. S.

By Joseph Carson, M. D.

These preparations are closely allied, both as regards mode of formation and their employment. The same difficulties and embarrassments are peculiar to them, and the formulæ, as given by the authorities in England and this country, are by no means satisfactory. From the experiments and statements of Mr. Hallows, contained in Vol. viii. No. ix. of the Pharmaceutical Transactions, re-published Vol. xxi. page 178 of the American Journal of Pharmacy, correct ideas appeared to be entertained, and, as will appear in the sequel, these are by no means novel to our own pharmaceutists.

Two preparations of soap are directed by our own Pharmacopœia, with the express design of having a fluid or a solid consistence, to suit the convenience of the practitioner. But one formula is adopted by the L. E. and D. Colleges, which, although intended to give a fluid preparation for the most part, produces a solid one. "Soap liniment (says Mr. Hallows) or opodeldoc is always prescribed by medical men, under the impression of its being a liquid; and the public are so accustomed to use it in this form, that if it were offered them in the solid state, it would be rejected as useless, or inconvenient for application." British apothecaries

from this admission are therefore accustomed to deviate from their standard.

In connection with the subject, there are some facts which, although not new, are worthy of reconsideration. As regards the kinds of soap officinal in the Pharmacopœias of Great Britain and the United States, there is a difference. By the first named authorities are specified:

1. SAPO L. "Sapo ex olivæ oleo et Soda confectus." SAPO DURUS, Ed. Dub. "Spanish or Castile soap made with olive oil and soda."

2. SAPO MOLLIS, L. E. D. "Sapo ex olivæ oleo et Potassa confectus," L. "Soft soap made with olive oil and potash." ED.

The United States Pharmacopœia directs:

1. SAPO, U. S. "Soap prepared from soda and olive oil."

2. SAPO VULGARIS, U. S. "Soap prepared from soda and animal oil."

The object of making officinal the soft soap, "*Sapo Mollis*," by the British Colleges, is not apparent, as no preparations of soap are directed to be made from it. In fact, it is a coarse article unfit for other purposes than as a detergent, A single variety, the first named, then, is the only kind employed for pharmaceutical purposes. On the contrary, two varieties have been introduced into the U. S. Pharmacopœia. both specifically to be employed, and each of them presenting properties not possessed by the other. These two kinds are to be found in the edition of the Pharmacopœia for 1820, and were adopted again in the revision of 1830, thus being used for a period little short of 20 years.

Using the same soap (*Sapo, Sapo Durus*) the formulæ for LINIMENTUM SAPONIS differs in the British authorities. The London and Dublin Colleges direct a larger proportion of soap and less camphor to the pint of fluid, and this latter is the spirit of rosemary. While the Edinburgh College, employing less soap and more camphor, direct the solvent to be oil of rosemary and rectified alcohol.

Formulæ.

℞ Castile Soap, - - - -	℥v.
Camphor, - - - - -	℥iij.
Oil of Rosemary, - - - -	fʒvj.
Rectified Spirits, - - - -	Oij.
	Ed.

℞ Soap, - - - - -	℥iij.
Camphor, - - - - -	℥i.
Spirit of Rosemary, - - -	f℥xvi.
	L. and D.

Of the product afforded, according to the formula of the London Pharmacopœia, Mr. Hallows says it is a "firm jelly, which cannot be poured out of a bottle without being melted by heat," and to obviate this and obtain a fluid consistence, after several experiments, he found the best means were to dilute the spirituous menstruum with a fourth part of distilled water, and to use the volatile oil of rosemary with rectified spirit, (see formula A. J. P. vol. i., pp. 180,) instead of spirits of rosemary. In the officinal formula above referred to, it is obvious then, that the want of *aqueous dilution* constitutes the defect.

Let us now turn to the corresponding preparation in the U. S. Pharmacopœia: The Tinctura Saponis Camphorata. This article has given rise to several communications in our Journal, and it is admitted by practical pharmaceutists that the formula is defective, and that they are coerced to deviate from it. The principle difficulty consists in the want of permanent solubility of the soap in alcohol, as directed of sp. gr. 0.835, and which does not contain a sufficiency of water to retain it. Dr. Wood, in his comment upon this preparation, in the U. S. Dispensatory, (Ed. 1845,) remarks that "even this, the U. S. tincture, coagulates upon cooling, and requires the addition of a portion of water to enable it to retain the liquid form." The use of old hard castile soap is stated to create a greater difficulty, and the addition of three fluid ounces of water to the materials, is specified as being sufficient to prevent the coagulation at ordinary tem-

peratures. The necessity of water being employed in the preparation of *Camphorated Tincture of Soap*, being admitted on all sides, should not the quantity and mode of manipulation be distinctly set forth by our standard?

The quantity of water required has been variously estimated from a fourth* to a sixteenth† of the menstruum directed. The Dispensatory indicates a little more than the *sixth*, and we have been informed by Prof. Procter that he employs a *seventh*.

Another source of error may arise from the selection of the soap. It is now well understood that castile, or vegetable oil and soda soap is meant, but by not heeding the definitions in the Pharmacopœia, connected with the two officinal soaps, a difficulty may occur as in the case of the late Mr. Duhamel, (see American Journal of Pharmacy, vol. 9, pp. 281.)

ART. XLVI.—OBSERVATIONS UPON, AND IMPROVEMENTS IN, THE PREPARATION OF COLLODION.

By Charles S. Rand.

All solutions of prepared cotton, now in use under the name of *collodion*, are liable to objection, on account of the powerful contraction which takes place during the evaporation of the ether, and formation of the pellicle. In certain cases this is its most valuable property; but where merely a protecting envelope, or false skin is required and the surface to be covered is large, this contractility is an objection which has in many cases prevented its employment, and caused the substitution of preparations, in other respects

* Revision of Pharmacopœia by Committee of Philadelphia College of Pharmacy, 1830.

† Remarks on Soap Liniment by Augustine Duhamel, American Journal of Pharmacy, vol. 15, p. 163.

far inferior. In wounds of considerable extent, such an action would evidently result in the formation of an irregular cicatrix, and even more serious results might follow, from the tension upon surrounding parts.

At the request of those who had experienced these difficulties, I undertook a series of experiments with the view of producing a collodion possessing all the adhesiveness and transparency of the ordinary preparation, but deprived of the contractility. I endeavoured to combine with it a solution of gutta-percha in chloroform; but immediate precipitation was the result. Where the latter was in excess, the ether united with it, letting fall the gun-cotton: where collodion predominated, gutta-percha was precipitated.

It would be needless to mention in detail all the subsesequent experiments. The terebinthinates gave the most satisfactory results. A few trials sufficed to show that but a small quantity of resin or turpentine, dissolved in recently prepared collodion, would totally prevent contraction, and increase the adhesiveness of the preparation.

My recipe is as follows:

Take of	Prepared Cotton,	ʒij.
	Venice Turpentine,	ʒij.
	Sulphuric Ether,	℥v.

Dissolve first the cotton in the ether, add the turpentine, and by slight agitation complete the solution. I have preferred Venice turpentine as the least frequently contaminated by mechanical impurities.

The cotton used in these experiments was prepared according to Mialhe's process, by dipping carded cotton into a mixture of nitrate of potash and sulphuric acid: the ordinary commercial varieties being in all cases used.

The above proportions should be carefully observed, as an excess of turpentine will cause an opacity in the film, while too small a quantity will not overcome the contractile tendency. This opacity—or, more correctly, opalescence—

is, however, not permanent, generally disappearing in a few minutes.

When applied to the skin, this preparation forms a perfectly smooth transparent pellicle, more difficult to remove than that of ordinary collodion. Being more pliable, it yields to the motion of the skin and will not crack even after several days' application. It might be supposed that the turpentine would render it more irritating; but this is not the case owing to the absence of that mechanical stimulus, so powerfully displayed in the former solutions.

The addition of two drachms of mastic to the above may be at times advisable, if the pellicle be required of great toughness and strength; but it dries more slowly, and remains opalescent longer than that containing Venice turpentine alone. This preparation is much more suitable for the purpose of a varnish, than as an application to the skin.

The label of a small vial was coated with it, and exposed thirty-six hours to the action of cold water which was afterwards raised to the boiling point—without any effect, except a temporary destruction of transparency. Cold and boiling alcohol were alike powerless.

Myrrh, balsam of tolu and gum benzoin were productive of similar results. Solutions of these in collodion, spread upon plates of glass, and permitted to dry spontaneously, or by very gentle heat, form pellicles, easily detached while yet slightly moist, and which when dry are very convenient for experimental purposes. If a film of perfect transparency is desired, certain precautions must be observed, or failure will result. The solution, after being poured upon the glass, must be partially protected from the atmosphere by an inverted capsule or similar vessel; a gentle heat applied beneath being advisable.

This mode of procedure has almost invariably resulted in the formation of a perfectly transparent pellicle; while portions of the same liquid evaporated in the open air, became cloudy, white, and sometimes perfectly opaque; an

effect due probably to the deposition of moisture from the atmosphere, condensed by the cold surface from which evaporation was taking place: the addition of even a minute quantity of water to collodion, being well known to produce immediate precipitation of a white insoluble substance.

Sheets of this material of any thickness may be prepared as before mentioned, by drying the solution upon glass plates. From a number of experiments upon this form of collodion, it was found that a slight increase in the quantity of Venice turpentine produced a more transparent and flexible film, resembling oiled silk closely in some of its properties; for which in certain cases it might advantageously be substituted. It is inferior to the silk in strength, nor can it be sewed, as the stitches give way immediately; but it possesses a great superiority in the absence of lead, which is largely present in the former, and which blackens upon the discharge of pus or other matters containing sulphur, from wounds, ulcers, &c. With this material no change is produced by any discharge, the number of substances affecting its sensible properties being very small.

If for a plate of glass be substituted a block of marble, the pellicle will present a beautiful crystalline structure resembling closely the film, which forms upon the surface of a saline liquid, when crystallizing. A temporary substitute for ground glass can thus be procured in a few moments.

The singular results afforded by every new experiment upon this interesting and curious substance, induce a belief that other characteristic properties will yet be discovered belonging to it, rendering it of great value and importance to the arts.

REVIEW.

ART. XLVII.—PRACTICAL PHARMACY: The Arrangements, Apparatus and Manipulations of the Pharmaceutical Shop and Laboratory. By FRANCIS MOHR, Ph. D., Assessor Pharmaciæ of the Royal Prussian College of Medicine, Coblentz; and THEOPHILUS REDWOOD, Professor of Chemistry and Pharmacy to the Pharmaceutical Society of Great Britain. Edited, with extensive additions, by WILLIAM PROCTER, Jr., Professor of Pharmacy in the Philadelphia College of Pharmacy. Philada.: Lea & Blanchard, 1849. pp. 576.

THE object of this work is well expressed in the title page which we have quoted. It is designed to instruct the pharmaceutist as to the arrangements, apparatus and manipulations necessary in his art. After a pretty thorough examination, we can recommend it as a highly useful book, which should be in the hands of every apothecary. Although no instruction of this kind will enable the beginner to acquire that practical skill and readiness which experience only can confer, we believe that this work will much facilitate their acquisition, by indicating means for the removal of difficulties as they occur, and suggesting methods of operation in conducting pharmaceutic processes which the experimenter would only hit upon after many unsuccessful trials; while there are few pharmaceutists, of however extensive experience, who will not find in it valuable hints that they can turn to use in conducting the affairs of the shop and laboratory.

The mechanical execution of the work is in a style of unusual excellence. It contains about 570 large octavo pages, handsomely printed on good paper, and illustrated by over 500 remarkably well executed wood cuts of chemical and pharmaceutical apparatus. It comprises the whole of Mohr and Redwood's book, as published in London, rearranged and classified by the American editor, who has added much valuable new matter, which has increased the

size of the book more than one-fourth, including about 100 additional wood cuts.

The first subject treated of is the general arrangement of the shop, or dispensary, the laboratory, the store-room, &c., and the succeeding chapters are devoted to the consideration of the various apparatus and manipulations necessary in pharmaceutic processes. Such as weighing and measuring, ascertaining specific gravities, use of thermometers, hydrometers, &c.; the construction and use of furnaces and other methods of applying heat; the mechanical contrivances for the comminution of drugs, such as mortars, cutting-knives, drug mills, &c.; filters, the clarification of liquids, the decolorization of syrups and oils; the construction of lever, hydraulic and other presses; evaporation; distillation; sublimation; the preparation of tinctures, extracts, syrups, capsules, pills, &c.; the purification of the fixed oils and fats used in pharmacy; the preparation of ointments, plasters, &c.; various miscellaneous operations, such as stoppering bottles and removing fixed stoppers, connecting and luting apparatus, working in glass, covering glass flasks with copper by galvanic deposition; the dispensing of medicines, and extemporaneous pharmacy.

The additions of the American editor are important, forming by no means the least valuable portion of the work. Nearly the whole of Chapter 12th, on the subjects of sublimation calcination, destructive distillation, &c., is original with him, as also the whole of Chapter 14th, on the important subject of the preparation and purification of the fixed oils and fats used in pharmacy, and on cerates, ointments, soaps, and plasters, besides numerous additions interspersed throughout the book. He has also added a chapter on the apparatus for testing, the re-agents necessary, and the methods of ascertaining their purity, taken from Bowman's Practical Chemistry, and a useful table of solubilities, compiled chiefly from Henry and Guibourt, &c., increasing greatly the practical value of the work to the pharmaceutist.

In the last number of this Journal, a series of pretty copious selections are inserted, calculated to show its general scope and character; and with these brief preliminary remarks, we will proceed to give further extracts from it, confining ourselves chiefly to the chapters on extemporaneous pharmacy, conscious that in this way we can give a better idea of the book, than by any observations of our own respecting it:

"The presence of soluble salts in an emulsion generally tends to cause a separation of the oil. Much spirit will produce a similar effect, especially in emulsions made with mucilage; and acids, in those made with alkali. Alkaline salts, however, in small quantity, are beneficial. Thus, a little borax will often be found greatly to improve an emulsion.

"There are some substances which cannot be formed into good emulsions with an alkali or with mucilage. Spermaceti and other solid fats belong to this class, and so also does oil of turpentine. In such cases yolk of egg is the best agent for effecting the admixture, the ingredients being rubbed together in a mortar; and, should any difficulty be expected, the oily or fatty body should be added gradually to the yolk of egg, and the mixture diluted with a little water, from time to time, as it thickens.

"Volatile oils are more readily emulsionized by previous admixture with a little fixed oil—especially those of the turpentine class, as oil of copaiba, cubebs, cajuput, etc. The yolk of egg owes its advantages over the white, for this purpose, to the fact that it is itself a natural mixture of fixed oil and albumen. A good spermaceti mixture may be made by triturating that substance with half its weight of olive oil, then adding the proper quantity of gum arabic, and after mixing them, adding the water gradually, in the usual manner of making an emulsion. Camphor is frequently prescribed in mixtures suspended with mucilage. It is usually pulverized by the addition of alcohol, triturated

with the gum in powder, and lastly the water added gradually in the manner of making an emulsion. A much more permanent and better mixture is obtained by triturating the camphor to a uniform paste by the addition of half its weight of olive or almond oil, then adding twice its weight, or more, of powdered gum-arabic, mixing intimately, and adding the water gradually, triturating constantly till the whole is mixed.

"One of the best ways to make a camphor mixture, when the addition is not contraindicated, is by means of myrrh. One part of that gum-resin will suspend four parts of camphor. The tears richest in volatile oil should be chosen, as in making an emulsion of myrrh, the camphor should be powdered by the addition of a little alcohol, and added to the myrrh previously reduced to a milky paste with water, the two then triturated until uniformly mixed, after which the water is gradually added.

"When a few drops of croton oil are directed to be suspended in mucilage, it is well to admix a little olive oil, so as to increase its quantity and render the emulsion more permanent.

"Scammony mixes very readily into an emulsion with a little milk; and resin of jalap, which will not mix with milk, may be diffused through emulsion of almonds by triturating it with the almonds and water."

A few instances will now be specified in illustration of the foregoing principles, and with the view of more fully explaining the mode of proceeding in the preparation of pills. The principal substances which enter into the composition of pills will here be divided into classes which will be considered separately.

Rhubarb may be taken as the type of a class of substances frequently administered in the form of pill. *Jalap, ipecacuanha, ginger, conium, digitalis,* and other vegetable powders belong to this class. Now, taking these substances as a class, syrup is perhaps the best excipient to use for

giving them the pilular form. With some of these powders the use of an excipient that possesses and can impart adhesiveness is necessary; and with all of them the presence of sugar is beneficial in preserving the vegetable principles from decomposition, and preventing the pills from becoming very hard. Simple syrup is commonly used as the excipient, but there is an advantage in the substitution of uncrystallizable for the crystalline sugar which the simple syrup contains; treacle, therefore, is sometimes employed with advantage. If it be desired to deprive the treacle of its peculiar taste and smell, and of some of its color, this may be done by diluting it with three or four times its weight of water, filtering the solution through a bed of animal charcoal, and finally evaporating it to the required consistence. Powdered conium, and other powders of this kind, retain their properties unimpaired for a great length of time when made into pills with a syrup of uncrystallizable sugar.

"There are cases, however, in which the use of syrup with some of the powders alluded to, is subject to inconvenience. Thus, when rhubarb or jalap is made into pills, it is often desirable to have as large a quantity as possible of the active ingredients in each pill. From three to five grains of the powder are frequently prescribed in a pill, and in such case it is desirable to use an excipient that will add as little as possible to the bulk. If syrup be used as the excipient for rhubarb, it will be found that a drachm of the powder will require a fluid-drachm of syrup; and this would make pills of four or five grains of rhubarb inconveniently large. Where it is important to add as little as possible to the bulk of the pill, water may be used as the excipient for rhubarb. It does not form so plastic a mass as syrup does; and, moreover, the pills, if long kept, become very hard, but the size of the pills will be less than would be the case if syrup were used. Spirit, especially rectified spirit, does not answer so well as water.

"In making rhubarb into pills with syrup, the whole of the syrup required for forming the mass should be added at once. A drachm of powdered rhubarb requires a fluid-drachm of syrup. If a portion of this quantity of syrup be first mixed with the rhubarb, a hard mass would be formed, not sufficiently plastic to admit of being made into pills, and which it would be found very difficult to incorporate with the further portion of syrup required. On adding the required quantity of syrup at once, the mass is formed without any difficulty. The mode of proceeding in this case is just the reverse of that which should be adopted when a hard elastic extract, such as some specimens of extract of rhubarb, has to be incorporated with a powder, such as calomel or ipecacuanha, through the intervention of a liquid excipient, such as syrup. Under such circumstances, the quantity of syrup required should be added very gradually. If the whole of the syrup were put in at once, so as to make a very soft paste with the powder, the hard extract would slip about in this, and might perchance be projected out of the mortar in the attempt at effecting the incorporation of the ingredients. The quantity of syrup first added should be only sufficient to form a very stiff and tenacious paste with the powder, and this should be partly incorporated with the extract before adding more.

"*Jalap* is sometimes made into pills with tincture of jalap, when it is desired to have as much of the active ingredient as possible in each pill. In this case the spirit, as a solvent of some of the adhesive constituents of the jalap, imparts some degree of tenacity to the mass. The ingredients, however, do not yield a very plastic mass, and to succeed well in forming the pills, it is desirable to add the full quantity of tincture required at once, to make the mass rather soft, and to roll out the pills as quickly as possible.

"In making *rhubarb and ginger pills*, spirit and soap are sometimes used as excipients with advantage. ʒjss of rhubarb, ʒj of essence of ginger, and ℈j of castile soap, will

form a mass which may be divided into twenty-four pills, the size of which will not be inconveniently large. If strong essence of ginger, made as described at page 274, be employed, each pill will contain the active matter of fully two grains of ginger. The soap should be first rubbed with the essence, the rhubarb added, and the mixture allowed to stand until, by the evaporation of part of the spirit, it has acquired a good pilular consistence.

"*Aloes* may be taken as the type of the next class of substances to be noticed. The *resinous extracts*, *resins*, and *gum-resins*, will come into the same class. Soap, mucilage, proof-spirit, and alkaline solutions will be found to be suitable excipients in these cases. *Aloes* forms an excellent pill mass with a few drops of compound decoction of aloes, the efficacy of which probably depends upon the presence of the alkali. The *gum-resins* will assume a good pilular consistence on pounding them with a little carbonate of potash without any other addition. The *resins* sometimes require a little spirit, but unless there be other solid ingredients present which are insoluble in the spirit, the pills thus made will often lose their shape. In such case soap should be substituted for spirit. Thus, the *aloes and mastic dinner pills*, when spirit is used in making them, inevitably lose their globular form, but this will not occur if soap and a little water be employed as the excipients. ℥vj of aloes, ℥ij of mastic, ℥ss of soap, and f℥ss of water, mixed in an iron mortar previously made hot, will afford a good plastic mass while warm, and if rolled out while in this state, the pills may be kept in quantity without losing their form. They may also be made with tolerable success with mucilage.

"The *volatile oils* and *oleo-resins* constitute a class of substances which are occasionally made into pills, and in such case require peculiar excipients. Balsam of copaiba may be taken as a type of this class. Magnesia is the excipient most generally applicable. The copaiba balsam will gene-

rally assume a pilular consistence when mixed with an equal weight of carbonate of magnesia, and this is the best method of solidifying it, when the pills are required for immediate use. If the balsam should contain an unusually large proportion of essential oil, it may require more of the excipient, or it may be found convenient to dissolve a little white wax in the balsam previously to the addition of the magnesia. Sometimes the balsam is solidified by the addition of white wax alone. When sufficient time can be taken for the purpose, a very small quantity of calcined magnesia may be made to solidify balsam of copaiba or any of the fluid turpentines. One part of recently calcined magnesia, added to sixteen parts of balsam of copaiba, or true Venice turpentine, and allowed to stand for a week or two, will become solid and fit to form into pills. The mixture should be exposed to a gentle heat for about an hour, and should subsequently be stirred from time to time until it becomes solid. In this case, as in that previously alluded to, it must be observed that some specimens of copaiba, which are very rich in volatile oil, do not completely solidify without the addition of wax or of a portion of turpentine, such as Bordeaux turpentine. The peculiar action of the magnesia consists in the formation of a soap with the acid resins of the copaiba or turpentine, and this soap absorbs the volatile oil, which is the other constituent of the oleo-resin. Quick lime might be substituted for magnesia, and in some cases has been found to answer better.

"Certain *volatile oils*, without any other active ingredients, are sometimes prescribed in the form of pill. Thus, *oil of pimento, cloves, peppermint*, &c., have been ordered to the extent of three or four drops in each pill, the selection of an appropriate excipient being left to the dispenser. The best excipients to use in such cases are soap and magnesia.

"*Calomel* will form the type of a class of powders requiring an excipient which possesses and can impart adhesive-

ness. *Emetic tartar, antimonial powder,* and many other substances of this kind will come into the same class. Conserve of hips is a very useful excipient for this class of substances, at least for those of them which are not decomposed by the vegetable acid contained in the conserve. It answers very well for making calomel pills, the pills retaining a soft consistence for a great length of time. In some cases crumb of bread, treacle, or extract of liquorice, may be substituted for it. Pills made with crumb of bread, however, become very hard after being kept for some time. Castor oil is an excellent excipient for the *compound calomel pills* of the Pharmacopœia. The mass, when made with this excipient, will retain a uniformly good consistence, which is not the case when treacle is used.

"Crumb of bread is frequently employed as the excipient for *creasote,* and for some active agents, as croton oil and nitrate of silver, which are administered in very small doses.

"The effect, in some cases, of a judiciously selected excipient is quite surprising, and the pharmaceutical student would find that the subject offers an interesting field for further experiment. When it is found that a substance so apparently ill adapted for making into pills as a liquid oleo-resin, may be rendered fit for that purpose by the addition of a very small quantity of magnesia or lime, and that fatty substances, such as mercurial ointment, will assume a pilular consistence on the addition of a little phosphate of lime, he may hope to find equally simple means for subjecting other apparently intractable substances to the required purpose.

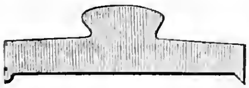
"In all cases it is very important that the whole of the ingredients of the pill-mass should be perfectly mixed and incorporated. When small quantities of active medicines form part of the ingredients, the precaution already alluded to in reference to the preparation of powders should be observed, that is, that such substances should be placed on the

top of other less active ingredients, and well mixed with them."

"The pill mass being formed, the next operation consists in dividing it into pills. This is effected by means of the pill machine. Little need be said with reference to the use of this instrument. In most cases the formation of the pills is a simple and easy process, yet cases will sometimes occur, in which, after exercising all his skill in making the pill-mass, the dispenser will find it difficult to roll the mass into pills, in consequence of its tendency to crumble. This is the case with jalap pills made with tincture of jalap, and more especially with the pills of volatile oil, magnesia, and soap. When the mass has a great tendency to crumble, the processes of forming the mass and of rolling out the pills, should be performed as quickly as possible. The mass should be made rather soft, and then immediately rolled and cut into pills, with a quick and dexterous hand, avoiding the application of much pressure in the process of rolling.

"The *pill-finisher*, fig. 476, is a useful appendage to the pill-machine. It is used for finishing off the pills after they have been cut in the machine, obviating the necessity of rolling them separately in the fingers. The finisher consists of a circular disk of wood, of which fig. 27 is a section; with a projecting rim on the lower surface, and a broad flat knob on the top, which serves as a handle. It may be made of pear-tree, or any other hard wood; it should be about three inches in diameter, and the depth of the rim should be rather less than the diameter of a pill. In fact, there should be two or three of these finishers with rims made to suit different-sized pills.

Fig. 27.



THE PILL-FINISHER.

"In using the finisher, the pills are placed on a tray, or on the platform of the machine, with some of the powder used for covering them, and the finisher, held by the knob,

being placed over them, is moved in a circular direction with increasing velocity, while a very slight pressure is applied.

"Several substances are used for covering pills, such as *magnesia, starch, liquorice powder, lycopodium, gold and silver leaf, gelatine,* and a mixture of *gum and sugar.* The application of these substances to the surfaces of pills is intended to prevent their sticking to each other or to the box, and also to prevent their being tasted during the act of deglutition.

"*Magnesia* is very commonly used for covering pills. As a light absorbent powder it answers the required purpose very well, yet there are some cases in which its use is not free from objection. Thus, for instance, if calomel pills be covered with magnesia, decomposition will, after some time, occur, the mercury being reduced, or oxide formed together with muriate of magnesia. Calomel pills that are kept ready made should never, therefore, be covered with magnesia; powdered starch might be used in this case.

"*Liquorice powder* is sometimes employed in preference to magnesia for covering pills, its sweet taste being considered advantageous in masking that of the other ingredients of the pills. There is, however, a very serious objection to the indiscriminate use of this powder, which arises from the fact that, with some persons, it occasions an irritation of the fauces, which deprives them of the power of swallowing pills which are thus covered.

"*Lycopodium* is but little used for covering pills in this country. It is extensively employed on the continent, and it forms, undoubtedly, the most suitable powder for the purpose. It is a light powder, the particles of which readily adhere to the moist surfaces of pills, without becoming themselves moist. It is also free from taste, and has no tendency to cause or to undergo decomposition. When lycopodium is used, it should be applied to the pills on the machine or in the finisher, and none of the powder excepting that

which adheres to the surfaces of the pills should be put into the box. Pills thus prepared have a much cleaner and more finished appearance than those to which a quantity of unattached powder is added, as is generally the case when magnesia or liquorice powder is used.

"The application of *gold or silver leaf* to the surface of pills is a very ancient method of covering them. The gilded or silvered pill is still occasionally administered, but much less frequently than formerly. The method of gilding pills is very simple. The pills are first rolled and cut on the machine, the mass having been previously made rather stiff, and little or no powder of any kind used on the pill-machine. Two or three sheets of gold leaf are now put into a suitable box. A turned box of a globular form, consisting of two hemispheres fitting together, and the capacity of which is about two ounces, is usually employed; but in the absence of this, a two ounce chip-box will answer the purpose. The metallic leaves having been loosely put into the box, the fore-finger and thumb of each hand of the operator is moistened with thin mucilage of gum-acacia, and two pills being rolled in the fingers so as to moisten their surfaces and render them adhesive, these are dropped into the box; others of the pills are subsequently treated in the same way, taking care that none of the pills thus introduced shall come into contact with the ungilded surfaces of those previously put in. When six or eight pills have been introduced into the box, the lid is put on, and a circular motion is given to the box, by which the gilding is effected. The process is repeated in this way until the whole number of pills required have received the metallic coating.

"The same mode of operating is adopted when silver leaf is used.

"Of all the methods adopted for covering pills this is the most objectionable. Gilded pills have often been found to pass through the entire alimentary canal without under-

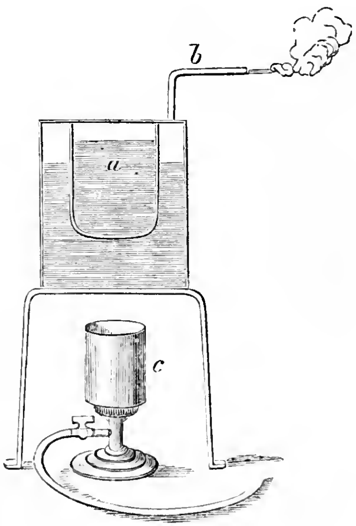
going any alteration, being completely protected by their metallic covering.

"The *covering of pills with gelatine* is the most elegant and efficient method of fulfilling the objects contemplated in the processes now under notice. A pill when thus covered, has a clean, shining surface, which is dry, hard, and not at all sticky. No powder is, therefore, required in addition to the gelatin. The ingredients of the pill being enclosed in a gelatinous case, are preserved from the action of the air, and, to a certain extent, are prevented from undergoing volatilization; moreover, the pill itself may be swallowed without perceiving taste or smell.

"The following is the method of covering pills with gelatin:

"In the first place, a solution of gelatin is prepared, consisting of one part of gelatin and two parts of water. This solution may be made in a little water-bath such as that represented in fig. 28. The gelatinous mixture is put into the vessel *a*, where it is surrounded by hot water contained in the outer vessel, and the heat is maintained by the gas-lamp *c*, while the steam escapes through the tube *b*.

Fig. 28.



"The pills are now made as in the preceding case, without using any powder, or if powder be used on the machine, it must be subsequently wiped off the pills.

"A number of straight, pointed wires are in the next

place provided, each of which should be about four or five inches long. The black hair-pins used by ladies, when made straight, answer the purpose very well. A large pin-cushion, or a dish filled with sand, in which the wires can be fixed erect, will also be required.

"Each pill is to be stuck on the point of one of these wires, and when they are all mounted in this way, the pills are dipped, one at a time, into the solution of gelatin, so as to be completely covered, and the wires are then stuck into the pin-cushion or sand with the coated pills at the top, as is shown in fig. 29. They are left in this position until

Fig. 29.

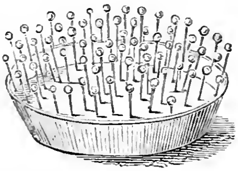
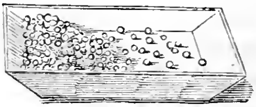


Fig. 30.



Coating Pills with Gelatin.

the gelatin has become firm, which will be in about ten minutes or a quarter of an hour, when the pills are removed from the wires and put in a tray, fig. 30, where they are left to dry.

"It will generally happen that in dipping the pills, a portion of the wires will become covered with gelatin, and this, on removing the pills will remain attached to them, forming little projecting tubes, which should be cut off with a pair of scissors. If it be desired to make the coating of gelatine perfect, the hole at which the wire has entered the pill, must be touched with the point of a camel's hair pencil previously dipped into the solution of gelatin.

"*Gum and sugar* are sometimes used for covering pills. The pills are put into a hemispherical metallic pan, which is slightly warmed, and a small quantity of the solution of one part of gum in two parts of water is added, so as to

moisten the surface of the pills. Some powdered sugar is then sprinkled over them, and by moving the pan they are thus covered with a coating of sugar. They are subsequently placed on a seive and exposed in a warm room until they become dry. If a thicker coating be required, the process is repeated." A. S.

ART. XLVIII.—CHEMICAL ANALYSIS, QUALITATIVE AND QUANTITATIVE. By HENRY M. NOAD, Lecturer on Chemistry at St. George's Hospital, &c. &c., with numerous additions, by CAMPBELL MORFIT, Practical and Analytical Chemist, &c., with illustrations. Philadelphia, Lindsay & Blakiston, 1849. pp. 572.

THE importance of analytical chemistry as a handmaid to the arts, is a sufficient reason why we should hail with pleasure the publication of works devoted to that branch of science. We have every reason to feel gratified with the progress of manufacturing chemistry in the United States, as exhibited in the increased number and improved quality of specimens of chemicals exhibited at our annual exhibitions ; and also with the attention that many apothecaries have given to such parts of chemical science as have a pharmaceutical bearing. We believe, that, if for no other reason than the ability it confers of detecting adulterations, apothecaries should give a portion of their time to acquiring a knowledge of analysis. The book before us is one of several that have been published on the subject, and treats it in a manner calculated to facilitate the labors of the student. Several important additions have been made by the American Editor calculated to improve the work, and bring it down to the time of publication. We do not agree with him, however, in the propriety of omitting the short chapter on manipulation, notwithstanding its brevity, which appears in the original edition.

ART. XLIX.—COMPARATIVE EXAMINATION OF THE DIFFERENT METHODS OF PREPARING THE IODIDE OF LEAD.

By T. Huraut.

Several methods of preparing the iodide of lead have been described, each of which furnishes tolerably satisfactory results. When executed with care, they yield a pure product; and the quantity obtained is not far below what theory requires. It is consequently indifferent which of these processes is employed when only small quantities of iodide are prepared; but when these are considerable, the differences become sufficiently great not to be neglected. There is another not less important condition, which ought constantly to be kept in view with every preparation; it is the obtaining a beautiful product. Now it has long since been observed, that the mode of operating and the nature of the substances employed in the preparation of the iodide of lead, have a very considerable influence on the appearance of the iodide.

Before describing my experiments, I must observe that each process has been repeated twice, and each operation performed under the same conditions, in order to obtain accurate results comparable with one another; I may add, that in all cases distilled water was employed; that the purity of the iodine and of the iodide of potassium was previously ascertained; that the nitrate and neutral acetate of lead were prepared expressly for these experiments; and lastly, that in each experiment a weight of iodine or of iodide was employed which should furnish according to theory, 18.20 grms. iodide of lead.

1. *Process by Iodide of Potassium.*—This process is the oldest employed; it consists in decomposing the iodide of potassium with a salt of lead. The French Codex prescribes the neutral acetate; but that salt has been generally

abandoned, since Messrs. Depaire and Boudet have shown that the iodide of lead dissolves in considerable quantity in the acetate of potash which is formed by the double decomposition of the iodide of potassium and acetate of lead. The loss, according to M. Boudet, is about one-tenth.

13.10 grms. of iodide of potassium, containing 10 grms. of iodine, were treated with neutral acetate of lead, the weight of the precipitated iodide was 15.70, to 15.80 grms. To avoid the loss to which the use of acetate of lead gives rise, M. Boudet proposed to substitute for this salt the nitrate of the same base. On treating 13.10 grms. of pure iodide of potassium with a solution of nitrate of lead, 17.50 to 17.55 grms. of iodide were obtained.

According to M. Thévenot, this loss may be avoided by pouring into the liquid above the iodide of lead a little nitric acid, which precipitates the greater portion of the iodide of lead held in solution. I tried this plan, and obtained with the same proportions 17.50 grms. iodide of lead. On the other hand, I treated the wash-waters from the first experiment with a sufficient quantity of nitric acid to decompose the acetate of potash they contained, and I collected 1.45 grm. of iodide of lead in brilliant scales.

The iodide of lead prepared with iodide of potassium is of a beautiful lemon-yellow color, and entirely soluble in boiling water. Sometimes it is obtained in the form of minute brilliant laminæ, at other times without any crystalline form. This effect, which occurs in all the methods of preparing the iodide of lead, appears to me to be attributable to the more or less concentrated state of the liquors.

2. *Process by Iodide of Sodium.*—Hitherto the iodide of sodium has never been employed, as far as I am aware, owing to its liability to change by exposure to the air and heat. However, as it may be obtained in a pure state in the liquid form, I was curious to know the results it would yield, and converted 10 grms. of iodine into iodide of sodium, which furnished with acetate of lead 15.90 to 16.10 of

iodide, and with the nitrate 16.85 to 16.95. This iodide is perfectly similar to that obtained with the iodide of potassium, and is of a lemon color.

3. *Process by Iodide of Calcium.*—All the soluble iodides may be used for the preparation of iodide of lead, but not with the same advantage. Thus those, the preparation of which is attended with much difficulty or requires long time, are not used, whilst those which are readily and quickly prepared are employed indifferently. Till of late the iodide of calcium has not received any application; but a few months ago M. Criquellon having described a very simple and cheap method of obtaining it, this iodide may now be turned to account. To see whether it offered any advantage in the preparation of the iodide of lead, I decomposed a solution containing 10 grms. of iodine by a solution of nitrate of lead, and obtained 17.70 to 17.60 grms. of a beautiful orange-yellow iodide of lead. The second experiment, made so as to give a crystalline iodide, furnished a product of remarkable brilliancy.

I then treated a similar solution of iodide of calcium with acetate of lead; the weight of the precipitate was 17.25 to 17.40. This iodide was likewise of a beautiful orange-yellow color.

4. *Process by Iodide of Iron.*—In a memoir presented to the Ecole de Pharmacie of Paris, in 1840, M. Girault showed that the iodide of iron might be employed with advantage for the preparation of the iodide of lead; he pointed out the inconveniences which attend the use of this compound, and made known the precautions which should be taken to avoid them. Subsequently, in 1847, M. Gaffard, without being acquainted with the researches of M. Girault, likewise proposed the iodide of iron for the preparation of the iodide of lead; the prescription, however, which he has given has been justly criticised by M. Thévenot. But even in the corrected formula, the latter chemist has retained too large a proportion of iron. Although an excess

of iron is rather useful than otherwise, nevertheless I see no reason for employing three times more of that metal than is required.

10 grms. of iodine, converted into iodide of iron, and treated with neutral acetate of lead, afforded 16.70 to 16.75 iodide of lead. I obtained a more satisfactory result by precipitating the iodide of iron from 10 grms. of iodine with a solution of nitrate of lead; the product weighed 17.50—17.50 grms. The iodide of lead obtained from the iodide of iron is of an orange color, and dissolves entirely in boiling water. It possesses the same characters whether the acetate or nitrate of lead has been employed.

5. *Process by Iodide of Zinc.*—I am not aware that the iodide of zinc has been proposed for the preparation of the iodide of lead, and nevertheless this salt is the one now most frequently employed; its great solubility and the readiness with which it is obtained will readily account for the preference given to it; it is moreover not altered in the air. 10 grms. of iodine, converted into iodide of zinc, furnished 17.05 to 17.15 grms. iodide of lead on precipitation with the neutral acetate, and 17.40 to 17.45 with nitrate of lead; the iodide is of a pale orange-yellow color, sometimes lemon-colored.

6. *Process by the Double Iodide of Potassium and Lead.*—In a recent paper on the iodide of lead, M. Thévenot has proposed a new process for preparing this salt; it is founded on the decomposing action of water upon the combination which the iodide of potassium forms with the iodide of lead. This compound is prepared in the following manner. Take—

Iodide, ...	10 parts
Iodine of potassium, . .	10 "
Distilled water, . . .	5 "
Divided lead, . . .	a large excess.
Nitrate of lead, . . .	10 parts.

The four first substances are mixed in a beaker, and set

aside for twenty-four hours. The whole of the iodine has then disappeared, and only the excess of lead is left; this is coated with a yellowish-white substance of a crystalline appearance, which is the potassio-iodide of lead. To obtain the iodide of lead which this compound contains, it suffices to agitate it with water, which decomposes it into iodide of potassium and iodide of lead. The dissolved nitrate of lead is then poured into the liquid, which decomposes the whole of the alkaline iodide.

The above quantities should give, according to theory, 32.07 grms. iodide of lead; they furnished 31.40—31.45. This iodide is slightly shining, and of a pale lemon color. When seen alone, it appears satisfactory; but when compared with the iodides obtained by the previous processes, a difference is perceptible, which is far from being to its advantage.

Having found by experiment that the iodide of lead prepared with the iodide of potassium was of a beautiful lemon color, I was lead to imagine, from the result obtained by M. Thévenot's process, that since about three-sevenths of the product derived from the decomposition of the iodide of potassium were of a fine quality, the four-sevenths furnished by the decomposition of the double salt by water must be of a far less lively color. Experiment confirmed this supposition; in fact, the iodide so obtained is of so pale a yellow tint that one might be led to think it consisted in greater part of oxy-iodide. Moreover, its fatty appearance is not at all pleasant to the sight. I have repeated this experiment several times, and always with the same results. In these experiments the weight of the iodide produced from the decomposition of the potassio-iodide of lead by water alone was on the average 17.80; theory requires 18.20 grms.

From these results I conclude, that, in the preparation of the iodide of lead, the nitrate of lead, on account of the greater product, is more economical, notwithstanding its

high price, than the acetate, and should always be preferred to it whatever process is employed.

That the process by iodide of calcium is most advantageous as regards the quantity and quality of the product.

That since the two processes by iodide of iron and by iodide of zinc yield an equally beautiful product and in nearly the same amount, it is indifferent which is used.

That the process by iodide of sodium has no advantage; that by iodide of potassium is less economical, as this salt costs as much as the iodine, with which the other iodides may be readily prepared without loss and at a little expense, and furnishes nearly one-fourth less for the same weight. In fact, when iodide of potassium and acetate of lead are employed, there is a loss of 10 per cent.; but the greater portion of this loss may be avoided by substituting the nitrate for the acetate of lead, or by pouring into the supernatant liquid a sufficient quantity of nitric acid to decompose the acetate of potash.

Lastly, that the process by the double iodide of potassium and lead, although yielding a larger product than all the others, is less advantageous, in the first place from its requiring iodide of potassium, and secondly from the inferior quality of the iodide which it furnishes.—*Chem. Gaz., from Journ. de Pharm.*

ART. L.—ON THE PREPARATION OF COLLODION.

By J. B. Edwards, F. C. S., M. P. S., &c.

Much difference of opinion appears to exist among some distinguished French Chemists, as regards the solubility in ether of the ordinary explosive gun-cotton, as described by Mr. Maynard, in America; but since the discovery of M. Mialhe's process with nitrate of potash, I am not aware of

any experiments having been made on the subject, and therefore trust my experience may be of some interest.

In *L' Union Médicale* of the 7th September last, M. Malgaigne says, "The *American Journal of the Medical Sciences* contains an extract from a letter by Mr. Maynard, containing a formula for the preparation of collodion, *which might be supposed to be authentic.* According to this formula the cotton is to be treated with nitric and sulphuric acids, dried, and dissolved in pure sulphuric ether."

"Upon reading this letter, I lost no time in applying to M. Foy, Pharmacien to the Hôpital St. Louis, to obtain a quantity of this liquid, but he in vain attempted to prepare it either from the *acids united* or the *nitric alone.* I afterwards prevailed on MM. Dublanc and Mialhe to undertake its preparation, but they were not more successful, and *it was evident* that a formula which failed successively in the hands of *three* such *distinguished Chemists* WAS INCORRECT; M. Mialhe, however, undertook, at my request, the investigations which led him to the discovery of the method by nitrate of potash and sulphuric acid, which has always proved successful. The cotton so prepared does not deflagrate as usual, and leaves behind a carbonaceous residue on combustion. *The explosive cotton he found insoluble in* ether.

In the same periodical, shortly after, appeared a notice from M. Salmon, Surgeon to the Hôtel Dieu, of Chartres, who states that "contrary to the experience of MM. Foy, Dublanc, and Mialhe, I assert that collodion may be easily prepared by dissolving gun-cotton made by the mixed acids in sulphuric ether. *I have always prepared the adhesive liquid* by the method of the American author. The preparation of collodion, according to the process of MM. Millon and Gaudin, revived by M. Mialhe, is not always practicable, and is liable to great variations from the inconstancy of the product."

On the above, Soubeiran, in the same journal observes,

"I, like many others, have attempted to operate with a mixture of the monohydrated nitric and sulphuric acids. I have employed them sometimes with equal weights, at other times with equal volumes, and immersed the cotton for different periods from three minutes to an hour, and I have *never found it to dissolve in ether*. I do not, however, contend that it is impossible to do so, but I must think the other a more certain method, though the employment of the mixed acids has the advantage of convenience over the other.—*P. T.*, Vol. iii., No. cvii., p. 665.

Professor Simpson states that "usually an ounce of strong sulphuric ether will dissolve thirty grains or more of gun-cotton *in the course of a few hours;* but to form a complete pulp it will require to stand for a day."—*Pharmaceutical Journal*, Vol. viii., No. ii., p. 86.

My own experience coincides with that of M. Salmon. I take equal volumes of strong sulphuric and strong *fuming* nitric acids, mix them in a mortar or other convenient vessel, then immerse finely carded cotton in small portions, allowing each to remain about *one minute*, then plunging it into a large quantity of water, and teasing it out with a glass-rod, so as to become as loose as possible, yellow fumes arise from the cotton, and are washed away, and it is then perfectly white. This is then well washed from acid and dried, and it then INSTANTLY and PERFECTLY *dissolves in commercial sulphuric ether*, forming either a semi-solid jelly or thick liquid, according to the quantity of ether added. This is the *constant* and *uniform* result of several experiments I have made.

This cotton is also *highly explosive, and leaves no carbonaceous residue*, when fired.

The sources of fallacy, I imagine, are, either from employing weak acids, too long immersion, or ether of high rectification. The latter should not contain water, but sufficient alcohol to reduce its specific gravity to about 760° or 770°. Its solvent action is then instantaneous, and not as Simpson states, from three hours to a day!

I consider this process to be superior on many accounts to that of Mialhe. It is more readily prepared, and requires less washing than when entangled with sulphate of potash. It is explosive, and therefore answers both purposes. I have dissolved some with equal readiness that has been thus prepared more than a month; so that it may be convenient to keep the cotton prepared, and dissolve small quantities as frequently as required, and thus obviate the loss by vaporization which ensues on keeping a stock of the solution prepared.

I was led to make these experiments for Mr. Higginson, Surgeon of this town, who recently exhibited at the Literary and Philosophical Society, some evaporated collodion under the microscope, which had all the appearance of distinct and definite acicular crystals; and Mr. H. stated that he had made very frequent examinations, and observed an uniformity in their shape and arrangement, which convinced him that these were crystals of collodion, and not filaments of cotton.

It was suggested that there might be minute crystals of nitrate or sulphate of potash, and I therefore undertook to prepare some collodion without any salt to interfere: in this I have succeeded; but have not yet heard the result of Mr. Higginson's more recent investigations.

Allow me to caution those who are not in the habit of preparing gun-cotton, as to its highly explosive nature. The gaseous results of combustion, which of course at once occupy a very large space in the air, are thus given off at a *very high temperature*, so as to possess the property of inflaming other portions of cotton at a very considerable distance; and thus, on trying whether the cotton is sufficiently dry, by exploding a small portion, it should be removed for some distance from the remainder, or the whole will ignite, and if the operator be standing over it, his face may be severely burned, though no *flame* reaches it, the resulting gases being quite capable of blistering the skin. It is better to operate on small portions at once.—*London Pharm. Jour.*

ART. LI.—DECOLORIZATION OF SUGAR.

Specification of Patent of Johann Arnold Steinkamp, of Leicester Square, Leicester Street, in the County of Middlesex, Gentleman, for Improvement in the Manufacture of Sugar from the Cane, and in Refining Raw Sugar. Dated 18*th July*, 1848.

Now know ye, that in compliance with the said proviso, I, the said Johann Arnold Steinkamp, do hereby declare the nature of my said invention, and the mode of carrying it into effect, of improvements in the manufacture of sugar from the cane, and in refining raw sugar, to consist in clarifying and purifying the juice of the sugar cane, as well as raw sugar, by means of raw cotton, and other vegetable fibres, cut up or otherwise divided into small lengths, varying from about an eighth to a quarter of an inch long.

The external gloss on the raw cotton is destroyed by pouring hot water upon it, turning it about, and thoroughly wetting it, allowing it to remain in the water about twelve hours; it is then ready for use.

The apparatus required is a vessel (which I prefer to be rather wider in the top;) a cock is placed just above the bottom to draw off the liquid; above this there is a wooden frame crossed by thin strips of wood, over which a coarse cloth is stretched. In order to clean 100 pounds of raw sugar, two to two and a half pounds of raw cotton is required, which having been prepared as before described, when taken from the water and pressed by the hand, will weigh about six or seven pounds.

In order to clean a certain quantity of sugar, the requisite weight of prepared cotton is placed in the filter, and as much water is poured therein as will distribute it smoothly and equally in the water. The water is let out of the filter by opening the cock, and the cotton will fall into its proper position.

Upon this cotton a coarse cloth is laid, upon which a

frame crossed by thin strips of wood, which is to be so formed that when required it may be pressed down upon the cotton.

For the refining of raw sugar, to every thousand pounds weight of sugar I add five to six hundred pounds of water, one to two pounds of chalk in powder, and half a pound of starch (the starch not being absolutely necessary, but appears to have a beneficial effect.)

The sugar is then heated until it boils, and kept boiling from eight to ten minutes; during the time to be well stirred, and the scum or froth skimmed off. The liquor is then allowed to pass through a sieve, for the purpose of separating the liquor from the coarse impurities. The pouring in of the sugar will drive the water out of the prepared cotton, which will run off by the cock. This water is to be preserved, so that at the termination of the filtration, it may again be poured upon the cotton.

If the sugar should run off too quickly, the cotton is to be lightly pressed down, which operation newly prepared cotton will generally require, as it is very elastic and spongy, but when it has been in use a few times, it loses this character.

As soon as the sugar has passed through the filter, it possesses a very pure and sweet taste, and may now be boiled down to the point of crystallization, as the substances made use of in this cleansing, clearing, or refining of the raw sugar are perfectly neutral with respect to it. Less uncrystallizable sugar is produced, and as sugar so treated has a very strong tendency to crystallize, great attention must be paid to the boiling and claying processes.

By pouring water into the filter, it can be perfectly cleared of the sugar, while the impurities remain fixed in the cotton; and this will be evident by merely taking the cotton out of the filter, and washing it. After it has been perfectly cleansed and washed, it may be used again.

I may observe the cotton may be mixed and even boiled

with the sugar, and afterwards poured into the filtering vessel, and the liquor made to pass through the cotton, in place of the cotton being first put into the filtering vessel, as above explained.

I employ the same means as those before described, for clarifying raw sugar, for cleansing the sugar cane juice in the colonies, whether the juice be cleared by means of caustic lime, and afterwards through the cotton as before described, or better following my process, having the chalk mixed with the juice of the cane, quickly boiled up, and kept at the boiling point for some time, skimming the impurities as they arise, and then filtered through my cotton filter; then, for the most part, the fermentation and decomposition of the sugar will be prevented, as, at the boiling point, no fermentation can arise, (similar to the wort of beer) and the acids which are in the sugar are absorbed or neutralized by the chalk.

An overplus or surplusage of chalk is perfectly harmless by the filtering through the cotton, the chalk together with all azotic and extraneous substances are quickly removed. By this process the greatest possible produce in sugar will be gained, and the coloring product (the result, for the most part, of the decomposition of the sugar) will be avoided, and thus its quantity and quality will be increased, and ameliorated—in place of cotton, or in combination with cotton, other vegetable fibres may be similarly employed.

That which I claim as my invention, is the use of cotton or vegetable fibre, cut up or divided into small lengths, (preferring cotton to other vegetable materials) in the clearing, purification, and refining raw sugar as before described. In witness whereof, I, the said, &c. &c. &c.—*Lon. Pharm. Jour.*

ART. LII.—ON RICINOLEIC ACID.

By L. Svanberg, and G. Kolmodin.

Castor oil was saponified with caustic potash and the soap decomposed with muriatic acid; the fatty acids were entirely freed from chloride of potassium and glycerine by washing with water, and were then exposed to a temperature of 32° to 20°, when the ricinostearic acid and the other acids separated, and could be removed by filtration at this low temperature. What passed through the filter was mixed with caustic ammonia, but not in sufficient quanity to dissolve the whole of the fatty acid. The ammonia soap was precipitated with chloride of barium, and the baryta salt purified by recrystallization from its solution in alcohol as long as the crystals exhibited any difference in the amount of baryta.

In the analysis of the baryta salt, which had been previously dried *in vacuo* over sulphuric acid and had been crystallized five times from an alcoholic solution, we obtained 20.80 per cent. baryta. As the salt might possibly be an acid one, it was digested for several hours with hydrate of baryta, after which it was again several times recrystallized from alcohol. A salt which had been recrystallized nine times furnished 20.78 baryta, and the atomic weight according to this is 3639.18.

The ricinoleate of baryta gave on analysis—

Carbon,	58.776	36	59.157
Hydrogen,	8.964	33	9.099
Oxygen,	11.480	5	10.947
Baryta,	20.780	1	20 897

which agrees with the formula $BaO+C^{36}\ H^{33}\ O^{5}$. The composition of the anhydrous acid is according to analysis and calculation—

	Found.	Calculated.
Carbon,	74.193	74.784
Hydrogen,	11.418	11.389
Oxygen.	14.389	13·827

The atomic weight of the anhydrous ricinoleic acid, found by calculation, is 3616.2, which differs somewhat from the directly determined number, but not more than is frequently the case in compounds which possess a high atomic weight. The ready solubility of the ricinoleate of baryta in hot, and the sparing solubility in cold alcohol, especially favors the separation of this acid from those simultaneously formed in the saponification of the castor oil, as only one-third per cent. of this salt dissolves in cold alcohol of 0.815 specific gravity, and it crystallizes from the hot alcoholic solution on cooling in laminar crystals. When the baryta salt of an impure acid (altered by exposure to the air) is treated with alcohol, a large quantity remains dissolved in the cold alcohol. Both the free acid, as well as its salts, dissolved in alcohol, experience a change by exposure to the atmosphere other acids being produced. This behaviour is peculiar to most of the fatty acids when exposed for any length of time to the influence of oxygen, especially in the fluid state.

The salts of lime and lead are also very readily soluble in hot alcohol; but their solubility at different temperatures does not vary very much, especially the lime salt, so that this is not so well adapted as the baryta salt for studying the acid.

The affinity of this acid with Gottlieb's pure oleic acid is worthy of attention; it is such that these two acids might be regarded as differing solely in the number of the atoms of oxygen, the hydro-carbon radical being the same.

Pure ricinoleic acid, separated from its baryta salt by muriatic acid, is a very weak acid, the alcoholic solution of which faintly reddens blue litmus paper. It solidifies at about 32°.—*Journ. für Prakt. Chem. and Chem. Gaz.*

ART. LIII.—BREAD FOR DIABETIC PATIENTS.

Communicated by DR. PERCY, F.R.S.

IT appears to be now generally admitted, that in the treatment of Diabetes Mellitus, amylaceous matter should in a great or less degree be excluded from the diet. But, as is well known, under such restriction of food the diabetic patient soon becomes weary of the ordinary kinds of azotized matter, as beef, mutton, &c. Hence various substitutes for common bread have been proposed. Some years ago my friend Mr. Morson, of Southampton Row, London, prepared, at my request, specimens of bread containing gluten in various proportions. However, the result was not satisfactory;* it was only relished by the patient when it contained a considerable quantity of starch; and when the proportion of gluten was increased beyond a certain amount, it became so tough and tenacious as to be very difficult of mastication. I have also made trial of gluten bread, brought from Paris by Mr. Morson, but with no better success. Recently Dr. Prout has published a receipt for a kind of bread devised by his patient the late Rev. J. Rigg (*vide* Stomach and Renal Diseases, 5th ed. p. 44;) and this is probably the best substitute for common bread which has hitherto been proposed. Some time ago Mr. Charles F. Palmer of this town prepared for me with great care, specimens of bread from Dr. Prout's receipt; but patients to whom it was given complained of the difficulty in swallowing it, owing to the large quantity of bran which it contained. Mr. Palmer then suggested the matter of rasped potatoes, left after the complete removal of the starch by washing, to replace the bran. He carried the suggestion into practice, and produced a kind of bread which I think well deserves the attention or the profession. It has

* I do no not mean by this to assert, that bread deprived of a portion of its starch is not preferable to common bread for diabetic patients.

been extensively employed in the General Hospital of this town, especially by my friends Dr. James Johnstone and Dr. Fletcher, and also by several private practitioners, with decided advantage. In composition it may be considered as Mr. Rigg's bread, in which the bran has been replaced by the residual matter of the potato above mentioned. And in the fact of its being rendered light and porous by hydrochloric acid and carbonate of soda, precisely as in the preparation of Dodson's unfermented bread, it is, as must be obvious, an expensive article; but with many diabetic patients this will not be an object of consideration. It is improved in taste by being slightly toasted and eaten warm. I here subjoin Mr. Palmer's receipt:—

Take the ligneous matter of 16 lbs. of potatoes washed free from starch, ¾ of a pound of mutton suet, ½ a pound of fresh butter, 12 eggs, ½ an ounce of carbonate of soda, and 2 oz. of dilute hydrochloric acid. This quantity to be divided into eight cakes, and in a quick oven baked until nicely browned. At first gum-arabic in sensible quantities was also introduced into this bread, on the ground of the assertion of Professor Graham, that when that substance is taken by the diabetic patient, the proportion of sugar evolved from his system is not thereby increased, and that consequently it might probably supply matter for pulmonary oxidation. However, it was found that it rendered the bread tenacious and disagreeable; so that its use was subsequently abandoned. I wish it to be understood that whatever merit there may be in the production of this bread, it is entirely due to Mr. C. F. Palmer. My friend Dr. Evans suggests, and I think with reason, that this bread would probably be improved by the addition of a certain proportion of bran. Some gluten might also be added with advantage.—*Chem. Gaz., March 15th,* 1849.

ART. LIV. ON THE TOXICAL AND OTHER PROPERTIES OF "A SUBSTANCE ANALOGOUS TO GUN COTTON."*

By Wm. F. Jackson, M. D., of Brunswick, Maine.

During the last few years there have been several very valuable discoveries, but perhaps no one of them has created more excitement among chemists of every country than that of gun cotton by Schönbein, in 1846. No sooner had it been announced by him than various series of experiments were instituted, some of which resulted in the discovery of new substances, the value of which time alone can show. It is my purpose to call your attention to one of these substances discovered by Mr. Sobrero, a distinguished Spanish chemist, and announced by him in the "Comptes Rendus" for February, 1847. The article was copied into the "London Chemical Gazette," and attracted the attention of Mr. Morris Davis, an operative chemist of this city,† who was the first in this country to prepare and experiment upon it. It has also been prepared and experimented upon by one or two others; and all concur in saying that it is a most powerful excitant, and capable of producing the most injurious results even when taken in very minute doses. How valuable it may prove as a therapeutical agent I am not prepared to say; but when we consider how many of our most valuable remedies are the most virulent poisons, we have a right to infer that this may not be without its uses. Should it not prove valuable as a medicinal agent, it is certainly, in a physiological point of view, worthy of an extended and careful examination.

Mode of Preparation.—The mode of preparing this substance, given by Mr. Sobrero, is as follows: "When a

*Extracted from an Inaugural Dissertation recently presented to the Faculty of Jefferson Medical College.

† Philadelphia.

mixture of 2 vols. of sulphuric acid of 1.83 and 1 vol. of nitric acid of 1.43 is poured into syrupy glycerine, a very lively oxidation ensues, the product of which I have not ascertained; if, on the contrary, the above mixture of the two acids is placed in a freezing mixture, and glycerine poured into it, agitating to avoid all elevation of temperature, the glycerine quickly dissolves without any perceptible reaction; if the mixture be now poured into water, an oily substance heavier than water subsides to the bottom of the vessel; when it is washed with a considerable quantity of water, to free it entirely from acids, without any loss, as it is quite insoluble in that menstruum. When well washed, it is wholly dissolved in alcohol, and precipitated again by water, or dissolved in ether, and the solution left to spontaneous evaporation, when it is obtained in a state of perfect purity. It is readily freed from water by keeping it for a few days in vacuo over sulphuric acid.

"In this state the body has the appearance of olive oil colored slightly yellow; it has no odor; its taste is sweet, pungent, and aromatic; but in making this experiment great precaution should be used, for a very minute quantity held upon the tongue produces a violent headache for several hours. The effect upon the human body was experienced by several persons in my laboratory, and I have frequently felt its effect myself."

As far as my experience goes, it is not necessary that the acids shall be of the specific gravities given above, for in my experiments I used the Nordhausen sulphuric acid of 1.86 and nitric acid of 1.48, and succeeded perfectly. I am well satisfied that it matters little what the strength of the acid may be, provided that it is *strong enough*. The greatest difficulty which I met with was from the glycerine. In my first experiments I failed in every instance, in consequence (as I think) of the oxide of lead which had not been precipitated, and of the large amount of water which was combined with the glycerine. After having got rid of the lead

by precipitation, and having evaporated the glycerine to one-half, I found no difficulty, though great care was necessary to prevent the rising of temperature. Whenever the temperature rises above a certain point, an intense chemical action takes place, and a dense cloud of nitrous acid fumes is thrown off. Whenever this *improper* action takes place the capsule will be found to contain a substance resembling molasses both in color and consistence, soluble in alcohol and water, and having a sour and bitter taste, and an odor resembling somewhat that of burnt sugar. In one or two instances, the diminution of the nitrous acid fumes was preceded by a distinct explosion, and in one instance the contents of the capsule were thrown in all directions.

The acids are to be poured into the capsule, to be agitated for a few moments so as to mix them intimately, and allowed to stand until they are cooled down to the proper point. The prepared glycerine is then to be added *slowly*, and the mixture must be *constantly* stirred. It gradually, becomes thicker, and soon resembles honey both in color and consistence. It is now to be poured into water, and the substance sought for will, after a short time, be found in small opaque globules, resembling very much the globules of oil in an emulsion, at the bottom of the vessel. After having been thoroughly washed, it may be freed from water by means of the sulphuric acid, as recommended by Mr. Sobrero, or by means of a test tube having a very small aperture at the bottom; the substance being heavier than water, will of course pass off first. Care must be taken to prepare it only in small quantities, as explosions are very liable to occur, causing, of course, loss both of time and materials.

What the precise chemical nature of this substance may be, I am at present unable to state. My first impression was, that it was a nitro-sulphate of glycerine, but I am now convinced that the glycerine undergoes a decomposition, and that a new substance is formed from the combination of its elements with those of the acids.

Toxical effects.—On account of the unpleasant effects which this substance produces, it is almost impossible to find persons willing to make experiments with it, and even *medical students* are not over anxious to "gratify their curiosity." I have endeavored, while making my experiments, to avoid, as far as possible, all extraneous influences, and to make allowances where such might occur; but the position of a medical student is certainly not the one best calculated to conduct a series of experiments requiring so much care and precaution.

In the majority of trials I have used one-third to one-half of a drop of the alcoholic tincture, but occasionally I have increased the dose when I wished to get more decided effects. It is safer, however, to use small doses, and repeat if necessary, for the effects produced by large doses are both unpleasant and dangerous.

February 18th.—Pulse at sixty-five beats per minute, and body free from any unpleasant sensations—took one-third of a drop of the alcoholic tincture. In thirty seconds the pulse had risen to eighty beats per minute. Disagreeable sensation of fulness in the forehead. In thirty seconds more the pulse was at ninety, and the pain in the forehead quite severe. No other symptoms were developed, and in half an hour the pulse had returned to seventy beats per minute, and the pain was entirely gone. I then repeated the dose. The pulse rose as before to ninety-five, the pain in the head became quite severe, and a sensation as if the eye-balls were being pushed out, was produced. When the symptoms began to abate I again repeated the dose. The pulse *instantly* rose to one hundred and twelve. Pain in the head intense. Eyes protruding and injected, scintillations as in head affections caused by disordered stomach. Fulness at the base of the brain, and violent throbbing of all of the arteries of the head and neck. Labored action of the heart with a peculiar sense of oppression. I went into the open air, and in a short time the most striking symp-

toms disappeared, leaving only a sense of langor and an unpleasant sensation about the heart.

February 20th.—The above experiment was repeated, but no new symptoms were produced. The disagreeable feelings about the heart, however, were somewhat aggravated, but soon passed off.

February 22d.—Having recovered entirely from the former experiments, I determined to make another trial, using a larger dose, however, than I had done heretofore. The pulse was at sixty-six beats per minute, and perfectly regular. I took *one drop* of the tincture, and the pulse in less than a minute rose to one hundred and twenty-four beats per minute. It was hard, distinct, and almost incompressible. The heart labored violently and a lancinating pain passed from the region of the heart to the back between the shoulders. The pain in the head was almost unendurable, particularly in the forehead, and the disagreeable feelings at the base of the brain were far more severe than I had yet known them. Eyes were injected and seemed to protrude, the pupils were somewhat dilated. Flashes of light were almost continuous and vision of course indistinct. The tongue and mouth burned, and the former felt swollen and raw, and was affected by spasmodic twitchings. Respiration was not impeded, though there was a sensation of constriction about the chest. In two minutes the pulse had fallen to one hundred beats per minute, and was decidedly intermittent. The symptoms gradually disappeared, and in half an hour no positively disagreeable sensations remained. The same sensation of weariness and oppression about the heart was noticed as in former trials.

I have also the results of several other experiments, but as they do not differ materially from those given above, I do not think it necessary to detail them.

February 24th.—Experiment upon a cat. In attempting to put this preparation, in substance, into her mouth I accidentally touched the glass rod upon the end of her nose;

immediately her head was thrown backwards upon her neck, and maintained there. Saliva flowed freely from her mouth, which was open and the tongue protruding. The eyes were glassy and fixed, and the pupils very much dilated. She walked *backwards*, but with great difficulty, as her limbs were extremely rigid. The pulse was very rapid, but as I had neglected to count it before commencing the experiment, I could not tell how much it had been affected. As soon as she began to recover, I put about *three* drops of this substance into her mouth. There was no effort to move after a few seconds; the limbs were perfectly paralyzed and rigid. The contractions of the heart could not be counted, though they could be distinctly felt. Respiration was very difficult and rapid. The eyes actually stood out of the head, and the iris was scarcely visible. In about two minutes from the time in which I put the poison upon her tongue, she ceased to breathe, though the heart beat a few seconds longer. Spasmodic contractions of the legs occurred for some time after both respiration and circulation had ceased.

I intended to make an extended series of experiments upon animals, but circumstances beyond my control have hitherto prevented my doing so. At some future time, however, I hope to be able to give a more satisfactory account of the effects of this substance; sufficient has been done, however, after having made all due allowance, to show the great power, and the rapidity of its action.

In its toxical effects it resembles very nearly the aconitum napellus, but is far more rapid in its action, if not more fatal in its results.

Whether or not this substance will prove valuable in the treatment of disease remains yet to be seen, but I am well convinced that it is destined to occupy no mean position in the list of therapeutical agents.—*Medical Examiner, May*, 1849.

ART. LV.—ON EXPLOSIONS IN CHEMICAL LABORATORIES.

By Dr. A. Buchner.

The occurrence of explosions in pharmaceutical laboratories, is usually the consequence of some neglect in the process of distillation; thus in rectifying ether, the most frequent causes of explosions are air-tight closure of the apparatus, the employment of too high a heat, insufficient refrigeration of the receiver, or the escape of ether vapour, which mingling with atmospheric air, forms an explosive mixture, which becomes ignited by some burning body.

Likewise in the distillation and preservation of other very volatile and combustible liquids, such as spirit of wine, the various kinds of ether and volatile oils, similar accidents have happened from like causes.

In a pharmaceutical laboratory in Saxony, the operator, in rectifying turpentine by means of a copper still, had forgotten to pour water into the still. A short time after the fire had been lighted, a violent noise was heard in the still, and whilst the operator was endeavouring to ascertain the cause of it, the still-head was blown off with a loud report, and the escape of the greater part of the oil, by which the operator and two other persons were much scalded. In this case, the receiver had been probably fixed air-tight to the refrigerating tube.

A similar accident happened in another laboratory: a strong flaming fire had been applied under the still, and the operator left the place for a few moments. In a very short time the whole laboratory was enveloped in flames; the vapour of the oil of turpentine had been formed more rapid ly than it had been condensed; an escape in consequence took place, and the unconfined vapour became ignited by the fire under the still.

In another pharmaceutical establishment in Saxony, an explosion was caused by pouring naphtha from one vessel

into another. The naphtha was kept in a cellar, in a large tin bottle; but this being at the time of the accident only about a quarter full, its contents was poured into a smaller bottle, in the immediate vicinity of which was a burning candle. The oil ignited with such a violent explosion, that the tin bottle burst, and the burning naphtha was thrown about the place. In this case, probably, the cellar had not been kept sufficiently cool, or the burning candle had been standing for some time close to the tin-bottle, so that the vapour of the volatile oil mixing with the atmospheric air contained in the bottle, formed an explosive mixture. A case is known where a spirit of wine cask which was not quite empty, and which had been for some time exposed to the sun on a hot summer's day, had an explosive mixture formed within it, and which took fire on the approach of a candle.

Before the introduction of Woulfe's apparatus into pharmaceutical laboratories, explosions during distillations were of more frequent occurrence than at present. In distilling *liquor ammoniæ*, two accidents are known to have occurred, by one of which the operator lost the sight of both his eyes. Another happened in distilling concentrated acetic acid, in consequence of the junction of the receiver with the retort having been made air-tight by a bladder, and the receiver not being kept sufficiently cool.

A violent explosion once took place in a pharmaceutical laboratory, when some organic substance was subjected in a retort to decomposition and distillation with nitric acid. In order to explain the phenomenon, it is only necessary to call to mind the properties of xyloidin and of gun-cotton.

In the laboratory of Professor Trommsdorff, four dangerous explosions took place in the course of a few years. The one happened with the purple of Cassius. The precipitate of gold had been collected on a small filter, washed, and placed on a stand near the heated parlor-stove, where it remained for some weeks. Mr. Trommsdorff then introduced the pre-

cipitate into a small glass-bottle, and was closing it with a glass-stopper, when the bottle was blown to atoms in his hand. This explosion may be explained by the circumstance that close to the purple precipitate several other preparations had been dried and preserved, by which probably ammoniacal gas had been developed, so that gradually fulminating gold was formed.

The second explosion was caused by detonating silver, of which about two drachms had been prepared, and after drying taken from the filter and placed on a sheet of glazed paper, with the intention of introducing it from the latter into a bottle; it had been removed with the greatest care from the filter, so that nothing could adhere to the paper. In order to see whether the filter would detonate, Mr. Trommsdorff threw it into a wind-furnace, which contained red-hot coals, and stood about four or five paces from the table on which the detonating silver was lying. Unfortunately the detonation in the furnace was so violent, and caused so strong a vibration of the air, that the silver on the table simultaneously exploded, and caused considerable damage. The experimenters remained for some time quite deaf, and the explosion caused great alarm throughout the whole town.

The fatal accident which happened in 1842, at Apothecaries Hall, London, and by which the much lamented operator, Mr. Hennel, lost his life, must be yet fresh in the memory of our readers.

On another occasion, some melted copper was poured into a crucible, when immediately the fused metal was thrown up with great violence over the heads of the bystanders to the ceiling. The operator had cleansed the crucible, but not sufficiently wiped it, so that probably a few drops of water might have remained at the bottom, and these were converted into steam as soon as the glowing metal came in contact with them.

The fourth and more violent explosion occurred during

the distillation of phosphorus, in consequence of an incautious experiment. When the development of the combustible gas and the distillation were in full operation, Mr. Trommsdorff was about showing to his pupils that the gas was combustible; for this purpose, he approached a lighted match to the receiver, which contained water, but at the same moment the iron cupola, with which the furnace was covered, together with the fire pipe, were blown off with a loud report, and much damage was done to the apparatus. The probable cause of this explosion, was, that over the surface of the water in the receiver, atmospheric air was contained, which had mixed with the phosphuretted hydrogen, and formed an explosive mixture.

That very fatal explosions often take place in operations with nitre, is well known, and easily explained; but only one case has occurred in a pharmaceutical laboratory. A pharmaceutist had to make *Antimonium diaphoreticum*, and for this purpose put a crucible in a furnace, between red-hot coals, and then gradually introduced a mixture of powdered sulphuret of anttmony and nitre. without waiting for the deflagration, which did not immediately occur, as the crucible had not become hot. When all the powder had been introduced, an explosion took place, by which he was dreadfully wounded.

Chlorate of potash is far more dangerous than nitre. The accident which happened in 1817, in Munich, in consequence of the incautious treatment of a mixture of chlorate of potash, sulphur, sugar, and cinnabar for lucifer matches, will be remembered by many: (*Repert. für der Pharm.* iii, 119—126.) In fusing chlorate of potash for the evolution of oxygen and the production of perchlorate of potash, the greatest care is required to prevent any combustible matter coming in contact with it. This is proved by the following case. An apothecary intending to develop oxygen from chlorate of potash, employed a tubulated retort, the tubulure of which was closed with a cork. When the salt had

fused and gas was escaping, an explosion took place, which fortunately did not injure the experimenter. It is probable that a piece of the cork, which had begun to be charred, had fallen into the fused salt.

Explosions in experiments with Marsh's apparatus, when the jet of gas is ignited before all the atmospheric air is expelled, have also occurred. It is necessary to observe, that on all occasions, when it is intended to ignite the evolved hydrogen gas, care must be taken to allow sufficient time to elapse for all the atmospheric air to be expelled from the apparatus, or at least that so little may be left, that the mixture be incapable of exploding.

Explosions in operations with cyanide of potassium and ferridcyanide of potassium are rare, and the following, therefore, are worthy of notice:—A chemist had prepared cyanide of potassium by Liebig's method, but as the latter portions of it were bluish grey, and showed several spots containing iron, he attempted to purify a small portion by fusion. A violent explosion ensued, and the crucible was blown to atoms. The contents of the crucible were so entirely scattered, that the collected residue did not suffice to discover by a chemical examination, the cause of this unexpected phenomenon.

Dr. Elsner has described the following explosion, that occurred in preparing ferridcyanide of potassium. Chlorine gas had been passed into a rather large quantity of an aqeousu solution of the ferrocyanide of potassium. The gas was developed from common salt, sulphuric acid, and the oxide of manganese, in cast-iron vessels. In the course of the operation it was discovered that after some time a large quantity of muriatic acid was developed, in consequence of which the mixture was set aside and replaced by a fresh one. In the vessels in which the gas had been developed a brownish red, hard, stone-like mass was contained. This, upon examination, was found to contain chloride of iron and some undecomposed oxide of manganese, which, as it

appears, had escaped the action of the muriatic acid. Chlorine gas having again been passed for several hours from the fresh mixture into the solution of ferrocyanide, the latter was left standing in a wooden tub. Suddenly, and without perceptible external cause, a violent explosion took place in the premises where the operation had been performed, the whole building shook, and the windows and doors were partly torn off their hinges. The wooden tub, which contained the solution of ferrocyanide of potassium, and whose staves were an inch thick, was blown to pieces and parts of it thrown up the chimney.

The cause of this remarkable explosion, was undoubtedly the formation and decomposition of chloride of nitrogen. By the action of the free hydrochloric acid on the ferrocyanide of potassium, it is probable that cyanuretted hydrogen and some ammonia, and consequently sal ammoniac, had been developed. Now it is well known, that by the action of chlorine on sal ammoniac, there is formed chloride of nitrogen, which explodes with great violence when it is brought in contact with certain organic substances. Döbreiner long ago mentioned that chloride of nitrogen was formed when chlorine gas was conveyed into a solution of the ammoniacal chloride of zinc.—*Pharmaceutical Journal from Buchner's Repertorium.*

ART. LVI.—ON THE VOLATILITY OF FIXED SALTS IN THE VAPOR OF WATER, AND ON SOME OF THE PURPOSES TO WHICH THIS PROPERTY MAY BE APPLIED.

Being a Report by Messrs. Foy, Bussy and Hurant, on a Memoir.

By M. Larocque.

One of the most remarkable facts which the study of chemistry presents to us, is that of the volatility of certain essentially fixed substances, under the influence of the vapour of liquids in which these substances are dissolved. One of the oldest, and perhaps one of the most curious, facts of this class, is that presented by boracic acid. This acid, which is one of the most fixed bodies we know of, is volatilized in considerable quantity by the vapors escaping from the lagoons or muddy swamps of Tuscany, in the waters of which it exists naturally in solution. For some time this fact, which from its singularity might have been expected to attract the attention and investigation of chemists, passed unnoticed. It was only towards the year 1825, that M. Vogel made several experiments on this subject, and proved that boracic acid dissolved by alcohol, became volatilized in the vapors of this liquid. In 1830, M. Saladin, chemist at Orleans, showed in a very interesting paper, that arsenious acid, corrosive sublimate, hydrochlorate, arseniate and oxalate of ammonia, sulphur, lime, morphia, brucia, and veratria, were volatile under the influence of the vapors of water, alcohol, and ether. Since this period, we are not aware of anything having been published on this subject. Nevertheless, in 1846, M. Simonin, of Nancy, read before the Society of Medicine of that town, a paper, in which he proved that a great number of fixed bodies, both organic and inorganic, were capable of being volatilized in aqueous vapors; we do not know anything further respecting this paper, which was not printed.

The work we are now about treating of not only confirms most of the facts previously stated, but greatly adds to the number of fixed substances volatile in the vapors of the liquids holding them in solution, and, indeed, generalizes this fact, for nearly all the bodies on which the author has experimented possess this property. It is but right to state that M. Larocque has always operated on large masses of products, and that the evaporation of the liquid has always taken place in the open air, and in vessels of large surface.

The substances on which M. Larocque has experimented were, in the first place, potash and soda. These two alkalies, the non-volatile character of which has caused them to be called the fixed alkalies, are volatilized in sufficient quantity to produce a violent itching of those parts of the skin exposed to the air, as also a marked irritation of the throat produced by the vapors escaping from the copper in which the evaporation takes place. After potash and soda, M. Larocque mentions phosphate of soda, the nitrates of potash and soda, and the arseniates of these two bases, and observes that the volatility under the influence of aqueous vapors of these three kinds of salts, with reference to which so close an analogy had previously been traced, unites them still more closely. Following these substances come the sulphates of zinc, of mercury, of copper, and of iron, nitrate of mercury, nitrate of silver, cyanide of potassium, the red and yellow ferruginous cyanides, the neutral tartrate of potash, and the double tartrate of potash and soda. The volatility of these salts explains, in reference to one of them, the occurrence of an ochreous incrustation of subsulphate of iron, on the walls of the manufactories in which sulphate of iron is prepared on the large scale.

M. Larocque has also studied the action of heat on the solution of metallic chlorides, and he has observed that these products also possess the property of being volatilized in the vapour of water, but in various degrees. Thus, those of

very volatile natures, such as the chlorides of mercury, antimony, tin, bismuth, arsenic, iron, and zinc, are volatilized in considerable quantities, whilst those which are fixed, or but slightly volatile, as the chlorides of nickel, cobalt, copper, lead, and sodium, are carried up in but a small proportion. A similar effect takes place with the iodides; but sometimes these products are decomposed, and the iodine is set free. The same observation is applicable to ammoniacal salts, of which a few, such as the hydrochlorate and the carbonate, volatilize at a temperature under that of boiling water. Indeed, several acetates, butyrates, valerianates, and formates have given the same results.

This property, which certain bodies possess of volatilizing under the influence of the vapors of the liquids in which they are dissolved, has given rise to their application for several purposes, a few of which are of some importance. M. Larocque has also endeavored to render this property available, and the papers and designs which have been brought before you, seem to indicate that it may possibly be used with some advantage in the manufacture of paper hangings; but, it must also be said, that further trials will be necessary in order to arrive at a satisfactory practical result.

It is by means of nitrate of silver that these papers were produced. Several other salts, under the same conditions, gave similar results, but neither of them answered the purpose so fully as the one we have just named. The following is the simple process employed by M. Larocque in the preparation of these papers. In a room in which some tables, or extended cords, are placed, some sheets of white paper are spread. In the centre of the room a porcelain capsule is placed on a furnace, and a mixture consisting of two pounds of nitric acid, sp. gr. 1.38, and one pound of water, to this is added about a pound of silver, and a gentle heat is applied. Action immediately takes place, giving rise to a considerable disengagement of binoxide of nitro-

gen. It is at this moment, and during the whole time of the formation of nitrous vapors that the volatilization of the silver takes place, and the designs are produced. After twenty or forty minutes of exposure, according to the shade wished for, the papers are withdrawn and replaced by others. When the solution of the silver is complete, and all re-action has ceased, the liquor is evaporated and crystallized; the nitrate of silver obtained, is used in commerce in large quantities, so that papers are thus prepared without any expense.

According to the length of time the paper is submitted to the vapors of the silver, and according to the distance from the point of emission of the vapors at which the papers are placed, so a plain colored paper or a dotted one is obtained, the latter much resembling granite. If white designs are required, such as leaves, laces, &c., it is only necessary to place on the paper cut pieces of paper of the designs wished for before submitting it to the vapors. The Society has seen several specimens of this class, and amongst others the leaves of several plants, and some lace patterns, which were well executed.

The papers thus prepared are very strong, and they do not undergo and change by exposure to the light and air; this may readily be conceived as silver is the coloring principle. In what state does the silver exist in these papers? Is it in the metallic state, in the state of liberated oxide, or combined with organic matter? M. Larocque has made several experiments with a view to solve this question, but the results have not enabled him to decide definitely. Nevertheless, he appears to be in favor of the last opinion, for it seems to him difficult to account in any other way for the decoloration of the papers thus acted on by the simple contact of a solution of hyposulphite of soda, iodide, bromide, or cyanide of potassium. This latter salt, especially, easily removes the stains, of whatever age they may be, which the nitrate of silver produces on organic tissues.

It will not be to manufacturers alone that benefit will result from M. Larocque's investigations; in analytical chemistry, toxicology, pharmacy, and, possibly, therapeutics, some useful information may be derived. Thus, the chemist in evaporating his saline solutions, should apply a very moderate heat, if he wishes to avoid the loss of a portion of his products, especially if engaged in quantitative analysis. The toxicologist also should observe the same precautions, as inattention to this point might be attended with serious results.

The chemist will be careful not to use alcohol or ether which have been employed in preparing extracts or products, such as vegetable alkalies, or other active principles, unless it is for the manufacture of the same preparations or analogous products. Finally, the physician may, perhaps, combat certain maladies by agents administered in the form of vapor, having water or alcohol for their solvents.—*Jour. de Pharm., and Lond. Pharm. Jour.*

ART. LVII.—ON A NEW KIND OF COPAIVA BALSAM.

By. Dr. L. Posselt.

The various kinds of copaiva balsam hitherto met with in commerce furnish, when mixed with a solution of potash or ammonia, a more or less clear solution. After some time the ammoniacal solution deposits the ammonia salt of an acid resin, the copaivic acid. When this reaction does not take place, it has hitherto generally been assumed that the balsam has been adulterated. The author procured from England a balsam which had been derived from South America, the genuineness of which was guaranteed, and was likewise placed beyond all doubt by the results of

analysis; he is therefore of opinion that there exists a distinct kind of copaiva balsam, which has the greatest resemblance to the ordinary kind; but differs considerably from it in its characters. It is more liquid, and of a lighter yellow color, has the peculiar disagreeable odor of the ordinary balsam, and also the lasting taste. Its specific gravity is 0.94. Mixed in any proportion with solution of potash or ammonia, it remains turbid, and never forms with it a soapy mixture, but after a time again separates from those liquids. It does not dissolve perfectly in alcohol, but forms a milky liquid. It contains 82 per cent. of oil and 18 per cent. of resin, which latter is partly soluble and partly insoluble. The oil in the pure state is a

Hydrocarbon, $C^{10} H^{8}$ which the author calls *paracopaiva oil.* It is obtained by distilling this copaiva balsam with water. After a second distillation with water, the hydrocarbon forms a colourless thick oil, of a strong pure odor of copaiva and an acrid burning taste; spec. grav., 0.91; boiling point, 485°. This, however, quickly and uninterruptedly rises, the boiling oil being decomposed. It becomes yellowish, then brown, thick and tenacious, until it is finally decomposed entirely with separation of carbon. It mixes in every proportion with æther, requires a rather large quantity of absolute alcohol for solution, and dissolves with great difficulty in spirit of 0.863 spec. grav. Dry muriatic gas combines with it, forming a brown liquid with a reddish tint, which when saturated fumes in the air. No crystalline compound could be separated from it. This paracopaiva oil differs therefore from the ordinary oil by its thickness, its behaviour towards alcohol, muriatic acid gas, and its boiling point.

Nitric acid of 1.32 spec. grav. has no action upon the oil at the ordinary temperature; but on the application of heat it is converted, with a violent reaction, into a resinous substance. It dissolves entirely in dilute nitric acid in some days, when nitrous acid, carbonic acid, and some peculiar

volatile acids which furnish a precipitate with basic acetate of lead, escape. The residue, evaporated and diluted with water, deposits an acid resin, which is not further acted upon by nitric acid, whilst a crystalline acid remains dissolved in the liquid.

The resin is of a a light yellow color, somewhat soluble in boiling water; it becomes milky on cooling. It dissolves readily in æther and alcohol, and after a considerable length of time some small crystals of the resin are deposited. It has an acid reaction, and combines with potash and ammonia, forming red neutral compounds soluble in water.

The acid left in solution crystallizes in minute, colorless, transparent laminæ. It is readily soluble in water, alcohol, æther and naphtha. It is free from smell, has a bitter taste and a faint acid reaction. It deflagrates with fuming nitric acid. Iodine dissolves in it; with chlorine it gives off vapors of muriatic acid gas, and then becomes yellow and tenacious. It acquires a dark violet-red color when treated with concentrated sulphuric acid. The analysis of the paracopaiva oil gave—

Carbon	88.13	10 =	60	88.23
Hydrogen . . .	11.77	8	8	11.77

The resin, which with the paracopaiva oil, constitutes the original balsam, was prepared by boiling the residue of the distillation of the oil with water to expel the remainder of the oil. The residual pale brown friable mass consists of two different resins, one of which is readily soluble, and the other insoluble in alcohol. The *soluble* resin forms the greater portion of the mixture, and may be readily obtained pure by repeated solution in alcohol, when the second resin is left behind. It is light yellow, easily reduced to powder, soft at a gentle heat, and is decomposed at a slightly elevated temperature, becoming dark-colored and forming a thick liquid. It dissolves in weak boiling spirit, but separates for the greater part on cooling in white flakes; it is

likewise readily soluble in strong alcohol in the cold, in ether and in naptha. The alcoholic solution does not possess an acid reaction; no precipitate is produced with acetate of copper; it is insoluble in potash or ammonia. On analysis this resin was found to contain 60.06–59.98 per cent. carbon and 8.48–8.27 hydrogen.

The resin *insoluble* in alcohol is repeatedly exhausted with absolute alcohol, dissolved in ether and separated by evaporation; it has the same color as the preceding one, is insoluble in dilute alcohol, and very sparingly soluble in boiling absolute alcohol, from which solution it mostly separates on cooling; it dissolves readily in ether and naptha. The solution is not acid. It is perfectly insoluble in potash or ammonia. On boiling these liquids with the resin, they become opake, and deposit on cooling the suspended resin. The solution of the resin furnishes with acetate of copper a slight precipitate. On analysis the resin furnished 81.76–82.12 carbon and 10.56–10 48 hydrogen.

It results from this investigation that this balsam is not ordinary copaiva balsam adulterated, but a distinct kind. The author had no opportunity of making any experiments as to its effectiveness.—*Chemical Gazette, from Liebig's Annalen.*

ART. LVIII.—ON COATING GLASS VESSELS WITH COPPER.

By J. B. Edwards, F. C. S.

Late Chemical Assistant in the Pharmaceutical Laboratory.

While assisting Mr. Redwood last session, I had occasion to make some experiments for him on this subject, with a view to obtain the necessary data for the best process. We then succeeded in coating vessels with copper, but did not obtain that smooth, equable surface and even texture peculiar to the specimens brought from Paris.

I have lately resumed these experiments, and succeeded in obtaining many specimens equal in every respect to the French ones both in smoothness and texture.

I first tried to deposite the metal from the cyanide of copper and potassium, and with success, for that salt deposites it in a state of great smoothness and beauty. I found, however, several objections to this mode—it was troublesome, on account of requiring an elevated temperature (from 100° to 130°.) The solution did not keep of uniform strength, as it soon became surcharged with copper which checked the operation, and though of great beauty when just finished, the coating soon changed color, assuming a blackened appearance. I therefore again tried the sulphate, and found no difficulty occurring with that salt, if the following points are carefully attended to:—

1st. The bronze-powder must be of the best quality and finely divided—the varnish should be nearly dry before being covered with it, and after the bronze is on should be allowed to become perfectly hard and dry before it is immersed in the solution.

2d. The battery power should be regulated by the size of the vessel to be covered. A few experiments will point out the proper size.

3d. The solution (that recommended in *Practical Pharmacy*, page 320, answers perfectly,) should be kept as

constantly agitated as possible. Upon this the smoothness of the coating greatly depends.

If the liquid be kept in constant motion by syphoning from a supply vessel, and again into another receiving vessel, specimens of great beauty may be obtained.

I find the best metallic surface is obtained by first dipping the bronzed flask for a single moment into a silver solution in connection with a small battery (cyanide of silver and potassium is best,) an almost imperceptible coating of silver is immediately deposited, upon which the copper takes beautifully, covering the whole surface instantaneously, instead of gradually creeping down from the connecting-wire as it does on the bronze alone. Thus a perfectly smooth and *uniform* coating is produced, which is soon covered of sufficient thickness.

I have now covered a great many vessels, and with an uniform and certain result, without difficulty, and strongly recommend to every chemist this highly useful and economical form of apparatus.—*Pharmaceutical Journal.*

ART. LIX.—MECCA OR BUSSORAH GALLS.

A SPECIMEN of galls, called *Mecca galls*, were presented to the Pharmaceutical Society by Mr. Luckombe, who informed Dr. Pereira that they were imported from Bussorah.

Dr. Pereira stated that these galls were identical with those described and figured in the 17th volume of the *Transactions of the Linnæan Society*, 1847, by the late Mr. A. B. Lambert, whose specimens were brought home by the Hon. Robert Curzon, from the Holy Land.

Mr. Curzon stated that the tree which produces them grows in abundance on the mountains in the neighborhood of the Dead Sea, and is about the size of our apple-tree. It is

perhaps, the *Quercus foliis dentato-aculeatis* mentioned by Hasselquist as growing on Mount Tabor (*Trav.*, p. 281.) The galls are described by Mr. Lambert as being pear-shaped, but some of those presented to the Society by Mr. Luckombe are round. Their size varies from that of a large hazle nut to that of a small apple. Towards the middle or upper part of the gall, are one or more circles of small protuberances, some sharp-pointed others nipple-shaped. Mr. Lambert thought that these were formed by the gall insect for air or defence, or some other purpose. In each of the larger galls, there is an aperture through which the insect escapes, and in the centre there is a small round hole or *nidus*, where it has lodged. The substance of the interior is soft, spongy, and friable. To the taste it is somewhat astringent, and scarcely bitter. Mr. Lambert describes his being "as bitter as gall." This is the only point in which the Mecca galls differ from those described by Mr. Lambert. Mr. Curzon informed Mr. Lambert that these galls, when on the tree, are of a rich purple, and varnished over with a soft substance of the consistence of honey, shining with a most brilliant lustre in the sun, which makes the galls appear like a most delicious and tempting fruit. The dried specimens figured by Mr. Lambert are represented as being of rich or warm brown color, and as if varnished. This agrees with the samples presented by Mr. Luckombe, some of which present the appearance of having been varnished, at least in part.

Mr. Lambert states that he ascertained the leaves on Mr. Curzon's specimens were those of the *Quercus infectoria*, and that the galls are identical with those of commerce. The latter part of this statement, Dr. Pereira said, was certainly incorrect, the Mecca or Bussorah galls being very different from the nutgalls of commerce, and in fact, being at the present time unsaleable, which would not be the case with the genuine nutgalls. From information subsequently obtained by Dr. Pereira, it appears that two bags of these

galls were imported among a parcel of 108 bags of the common nutgalls. Both bags were slightly damaged. Being unknown in the London market, they were bought in at 40*s*. per cwt., while the genuine nutgalls fetched 115*s*. per cwt. It is stated by the brokers, that the Bussorah galls are alone used in the country where they are produced, for dyeing, and that they are more estimated there than comcomon nutgalls.

According to Mr. Lambert these galls are the far-famed *mad apples* (*Mala insana*) or *apples of Sodom* (*Poma Sodomitica*) mentioned by Josephus and many other writers. In the *Book of Wisdom* (chap. x. verse 7) these apples are described as "fruit that never come to ripeness," and in various old authors we are told that the fruit, though beautiful to the eye, crumbles at the touch to dust and bitter ashes. Milton in the tenth book of his *Paradise Lost*, compares the trees which resembled the forbidden tree of knowledge, as being

> "like that which grew,
> Near that bituminous lake where Sodom flamed."

Various opinions have been held respecting the nature of these apples. Hasselquist thought they were the fruit of *Solanum Melongena* (egg-plant nightshade, or mad-apple.) Seetzen considered them to be the fruit of a species of cotton-tree, and Chateaubriand thinks that they are a fruit like the Egyptian lemon, with a blackish seed, but whose name he does not mention.—*Ibid.*

ART. LX.—OBSERVATIONS ON ANHYDROUS NITRIC ACID

By M. Deville.

By treating nitrate of silver with absolutely dry chlorine M. Deville has succeeded in isolating anhydrous nitric acid, the existence of which is proved by numerous analyses.

This beautiful substance forms perfectly transparent colorless crystals of great brilliancy, and capable of attaining a considerable size when slowly deposited in a current of gas strongly cooled. They are prisms of six faces, and are apparently derived from a right rhombic prism. They melt at a temperature a little above 85° F., and boil at about 113°. At 50° the tension of this substance is very considerable. In contact with water it evolves much heat, and dissolves without any disengagement of gas or the production of any color, and then furnishes with baryta nitrate of baryta. Under the influence of heat its decomposition appears to begin very near its boiling point, which prevents the density of its vapor being determined by M. Dumas' process.

The method by which M. Deville procured the anhydrous acid is very simple; but the ease with which it penetrates caoutchouc tubes necessitates the uniting of all the parts of the apparatus before the blowpipe. The author employs a U-shaped tube, capable of containing 500 grms. of nitrate of silver dried in the apparatus at 356° in a current of dry carbonic acid. To this tube is joined another U-shaped tube of considerable size, and furnished at the bottom with a small spherical reservoir, in which a liquid, which is constantly developed during the operation, and which is excessively volatile, (nitrous acid?) collects. The tube containing the nitrate of silver is immersed in water covered with a thin layer of oil, and heated by means of a spirit lamp communicating with a reservoir at a constant level. The chlorine is evolved from a glass gasometer,

and its displacement is produced by a slow and constant flow of concentrated sulphuric acid; the chlorine is passed over chloride of lime, and then over pumice-stone moistened with sulphuric acid. At the ordinary temperature nothing appears to be produced; the nitrate of silver must be heated to 203°, and the temperature then immediately lowered to 136° or 154°, beyond which it should not go. At first some hyponitric acid is developed, recognizable from its color and its ready condensation; then, as soon as the temperature has reached the lowest point, the production of crystals commences, and they soon obstruct the recipient cooled to —6° F. They are always deposited on the portion of the receiver which is not immersed in the freezing mixture; and M. Deville has found that ice alone sufficed to determine their production. The gases are colored, and the spherical reservoir of the cooled tube contains a small quantity of liquid, which must be removed from the apparatus before transferring the nitric acid into another vessel. This last operation is easily effected by substituting a current of carbonic acid for the one of chlorine. The condenser is no longer cooled, and the bulb destined to receive the crystals is immersed in a refrigerating mixture, which is connected with the apparatus by means of a caoutchouc tube lined with asbestos. The chlorine should pass very slowly, between 3 and 4 litres in twenty-four hours. However, the whole of the gas is not absorbed by the nitrate of silver. Some oxygen is given off, apparently very nearly equal in volume to the chlorine consumed. An apparatus thus arranged goes on day and night without any looking after. It is merely necessary to renew the supply of sulphuric acid which displaces the chlorine, the alcohol which feeds the lamp, and the freezing mixture.—*Comptes Rendus*, Feb. 17, 1849.

At a recent meeting of the Academy, (March 5) M. Du-

mas communicated some further details concerning this highly interesting substance.

The tube containing the crystallized nitric acid exhibited to the members of the Academy having been left to itself became liquid. On attempting to make the substance crystallize again by means of a refrigerating mixture, the tube was destroyed with a violent detonation, owing to some accidental vibration. I suspect that the dry nitric acid was gradually decomposed into hyponitric acid and oxygen, and that the latter, from its state of compression, gave rise to the explosion. It is necessary therefore to handle this new product with precaution. Owing to this accident I am unfortunately unable to present to the Academy a very beautiful specimen of anhydrous nitric acid which M. Deville forwarded to me, the crystals of which were of considerable size, and from their beauty most readily admitted of the fundamental form of this substance being determined with certainty.—*Chem. Gazette.*

ART. LXI.—ON THE SEEDS OF THE RICINUS COMMUNIS.

By M. CALLOND.

M. CALLOND has been engaged for several years in the examination of the seeds of the *Ricinus communis*, or castor-oil plant. It is well known that these seeds yield a mild purgative oil (*castor-oil;*) but the mark from which the oil has been pressed retains an emetico-cathartic principle which the author considers to possess much interest. The castor-seeds, administered in doses of one or two drachms, either in their natural state, or made into an emulsion, generally produce hypercatharsis accompanied by vomiting. The mark or residue from which the oil has been pressed operates with nearly the same energy as the seeds in their natural state, from which it has been inferred that the mild

expressed oil owes its purgative property to the presence of a minute quantity of the active principle alluded to. It has even been supposed that the purgative principle was an oleo-resinous body. M. Callond affirms that this principle possesses neither the character of an oil nor of a resin. The following are the experiments upon which this assertion is founded :—

1. After having expressed the oil from the seeds by a powerful pressure, the mark was treated with pure alcohol and the filtered liquor submitted to spontaneous evaporation. The oily residue, administered in different doses, was found to have the same action as the expressed oil.

2. After having exhausted the seeds of everything soluble in boiling alcohol, the residual mark, when administered to the extent of seven or eight grains in a glass of sweetened water, produced nausea and salivation, which continued for more than six hours. Thirty grains, administered in two doses to a young man of strong constitution, caused vomiting, accompanied by much straining, for nearly twenty-four hours.

M. Callond is still engaged in these investigations.—*Pharmaceutical Journal from Journ. de Pharm.*

ART. LXII.—ON THE PREPARATION OF ETHIOP'S MINERAL.

By M. C. Vogler.

The usual method of preparing Ethiop's mineral, consists in triturating the mercury and sulphur together in a marble or porcelain mortar. The mixture is sprinkled from time to time with water or spirit of wine while the trituration is continued, until globules of mercury can no longer be discovered by means of a magnifying glass. This process is objectionable in a practical point of view, for as the

mixture becomes dry from the evaporation of the liquid employed, the dust is diffused through the atmosphere, and not only is there loss of product, but the operator suffers inconvenience from the inhalation of mercurial vapors. These evils may be obviated by adopting the following method of effecting the combination: the mercury is put into a strong stoppered bottle, with one-fourth of its weight of sulphur. These are shaken together for about two hours; more sulphur is then added, and the agitation continued until combination is completed. The process is conducted in this way in a shorter time, and with less inconvenience than that which is usually adopted.—*Ibid from Archiv. der Pharmacie.*

ART. LXIII.—PHARMACY IN SPAIN.

Report on MM. Chiarlone and Mallaïna's History of Pharmacy in Spain.

By MM. Cap and Gaultier de Claubry.

The authors divide their history into four epochs; the first extending from 640 before Christ to the third century of our era; the second, from the ninth to the sixteenth century; the third, from the sixteenth to the nineteenth century. The fourth epoch comprises the nineteenth century.

We will not dwell on the first epoch, the facts of that period relate to the general history of the sciences, and those appertaining to chemistry have been learnedly unravelled by M. Höefer. The portion of these details relating to our profession, has been compiled by one of us (M. Cap) in the *History of Pharmacy* now in course of publication, and of which the two first parts are principally devoted to the history of the pharmacy of the ancients.

The second period will appear the more interesting, in-

asmuch as it enlightens us as to the history of our art as practised by the Arabs.

A Jewish university established at Sara, in Asia, in the ninth century, produced some remarkable men.

In the Arabian schools of Cordova, Seville, Murcia, Saragossa, Toledo, &c. &c., the works of numerous authors are found, which are deserving of note. It is known that Abenzoar, who lived in the twelfth century, made the manufacture of syrups and electuaries his particular study—the preparation of medicines, the properties of medicinal plants, and the method of mixing them. In the fourteenth century, a work entitled *Liber Secretorum*, was written by Bubacar, in which he speaks of the salt of urine, and of a species of moon obtained in distilling urine with white clay, chalk, and carbonated organic matters, a process which greatly resembles that employed by Brandt in the 18th century, to obtain phosphorus, and which might have been already known by Bubacar.

Under the government of Alonzo the Judge, in 1252, divers laws were passed relative to the practice of medicine and pharmacy; inspections were made twice a year, from the commencement of the fourteenth century The *fueros* of the provinces necessarily caused differences in the legal enactments, but nevertheless, a general system of organization was manifested at this period. In 1403, under the reign of D. Martin, severe laws were established relative to the sale of active preparations, and punishments were inflicted when accidents occurred from their use.

Lopez de Villalobas wrote, in 1488, when but nineteen years of age, a treatise in verse, entitled, *A Summary of Medicine*, in which he devotes numerous stanzas to purgatives, theriaca, ointments, and plasters. Towards the end of the fifteenth century, Julius Gutieris de Tolédo wrote some interesting observations on syrups and juleps.

The first Pharmacopœia published by a chemist was in 1497, by Pierre Benedicto Matheo, who, as is seen, wrote

159 years before Michel du Scean; but the latter is considered by many authors, and in particular by MM. Henry and Guibourt, as being the first chemist who had written on this art. In 1486, Saladin d'Ascala wrote his *Compendium Aromatorum*, in which he describes the conditions necessary for the preservation of medicines. He mentions the following fact, proving that the adulteration of medicines has not been confined to our times. A chemist was fined 9,000 ducats, and deprived of his civil rights during twelve months, for having adulterated manna with sugar and starch.

Pharmacy in Spain made in the sixteenth century great advances, which the discovery of the New World must have singularly accelerated. In 1535, the College of Apothecaries of Barcelona, published the *Concordia Farmacopolarum Harchinonensium*, and that of Saragossa, in 1553, the *Concordia Aromatorum*, and the *Farmacopea Cesar Augustana*, which were complete treatises of Pharmacy, embracing all relating to that science. A special and very lengthy code of laws relating to Pharmacy was enacted, which deserve notice on account of the remarkable regulations they contained.

We regret not being able to analyze that portion of Drs. Chiarlone and Mallaïnna's work, relative to the state of Pharmacy in Spain during the third epoch; we should have found therein curious and important details, a great part of which are quite unknown in other parts of Europe. Until the present time, little attention has been paid to the scientific literature of a people, who, in many other respects, have furnished documents of a useful nature, so that the union of many special conditions were necessary in order to investigate all that that country had produced relative to Pharmacy. The authors of the work we are analyzing were in the most favorable position for this purpose, and have gladly profited by it.

The seventeenth century again offers much that is impor-

tant in the history of Spanish Pharmacy, both as regards the publication of numerous works by Chemists, and the legislation on this subject. Although much in advance of France in this respect, Spain was but very imperfectly known; the splendor of her conquests in the New World, and the importance of her wealth, attracted universal attention, and even those whose particular studies might be expected to have led them to a knowledge of the laws relative to our profession, partook of the general opinion as to the state of ignorance in the Peninsula.

We see in the eighteenth century a continuation of that movement previously given to Pharmaceutical science, and improved legislation in reference thereto, indicating here, as elsewhere, the disposition of the directing minds of that period. The number of books published, and the nature of the subjects to which they relate, are necessarily affected by the intellectual movement of this century, and in this respect Spain was not behind other nations. France has been accused—and it must be confessed not without cause—of not occupying herself sufficiently with the occurrences of other countries. German literature, and even that of England, are more *au courant* of what is publishing elsewhere than is the case in France.

A very interesting chapter of the work to which we are alluding terminates the history of the third epoch. It treats of the Pharmaceutical Colleges of Spain; we cannot refrain from giving some of the details. These establishments, anterior to all the scientific academies of Europe, existed at Valencia, Barcelona, Saragossa, Pampeluna, Madrid, Seville, Toledo, Tarrogon, and in some other towns.

The College of Valencia already existed in 1327, in the reign of King D. Alphonse, who granted to the Apothecaries of this city the rights of admitting into their body all those wishing to exercise this profession. In 1441, the Apothecaries petitioned the Queen, Donna Maria of Arragon, to be allowed to constitute the College into an associa-

tion for their mutual protection, and the exercise of charity to each other.

The privilege granted them orders that all apothecaries are to use uniform weights; it prohibits the sale, by those who have not been received by the College, of all distilled waters, excepting those of orange-flowers, rose, &c., and contains minute details as to the conditions of admission and other rules which we cannot enter upon.

In 1512, at a general meeting of Apothecaries, it was enacted that no one could be received until he had practised for eight years, instead of six, which was the former law; and rules were established relative to the theoretical and practical examinations the candidates were to undergo. In 1601, the College published the *Farmacopea Valentina,* of which there was a new edition in 1629. The College of Barcelona existed in 1352, and published a Pharmacopœia in 1535.

The fourth epoch of Pharmacy, which includes the present century, contains less unknown details than those preceding, but nevertheless deserves notice, especially in relation to pharmaceutical legislation, which was rendered much more perfect.

Carbonell's work translated into French, was at this period an interesting event in the history of Pharmacy; but many other works of some interest appeared at the same time.

Although the details relating to the history of pharmaceutical literature, with reference to the period anterior to our century, are full of interest, yet those which relate to the present century leave much to be desired.

We will content ourselves with referring to two instances illustrative of this: the works of Pelletier are noticed in so incomplete a manner that it would be difficult to form any idea of them; the names of Serrullas and Robiquet are not even found amidst those who have advanced French Pharmacy in our time. We must frankly say that this portion of the work is not nearly equal to the previous parts.

If the pharmaceutical legislation of our country has excited such numerous and legitimate reclamations, and if we are desirous of seeing it cast off that which it has inherited from past centuries, it is curious to see that Spain, which we imagine to be so much behind us, has preceded us in this respect in a remarkable manner.

At a time when the titles of nobility were a distinction to which all classes could not aspire, we are interested and surprised to find a privilege granted in 1650 by Don Philippe, placing in the same rank with Physicians all those practising Pharmacy, and declaring that they could not be admitted to the practice of any mechanical art, then looked upon as beneath that of medicine and the liberal arts.

In 1800 Don Carlos declared Pharmacy to be distinct from medicine, and formed laws relative to the examinations and inspections of Pharmacies. To be enabled to practise, the degree of bachelor and doctor of medicine was necessary in addition to that of licentiate of Pharmacy; the inspections were made by a physician and a chemist, and presided over by one of the elder professors of Medicine or Pharmacy. A higher assembly was established for the faculty of Pharmacy, and charged with all the details of administration for the whole kingdom.

In 1804, the same sovereign made several modifications to the previous laws; he established a botanical garden, and a museum of natural history in each college; the pupils had to attend for three years the practical and theoretical lectures of the colleges.

In order to pass from one course to another, the pupils had to undergo a severe examination on each subject of their instruction. To obtain the degree of Bachelor, they were required to lecture in Latin for half an hour, on one of the branches of pharmaceutical science.

The grade of Licentiate was to be obtained after two years practical exercise in the laboratories of the faculty, or in a chemist's shop; a theoretical examination, and one on

practice, on two different days, were obligatory. After these examinations, the candidate was required to recognise and define a certain number of plants and medicines, and answer queries relative to the doses in which very powerful medicines are administered. The licentiate might practise pharmacy throughout the kingdom. To obtain the degree of Doctor, the candidate was required to treat on any subject chosen by the College, and to answer all arguments presented to him. Some laws relating to military pharmacy completed the code.

In 1815, Ferdinand VII. remodelled the higher assembly, and extended pharmaceutical instruction, which from that time has consisted of a course of natural history, of physics, of chemistry, practical pharmacy, and of theoretical pharmacy.—*Pharm. Journ., from Journ. de Pharm.*

ART. LXIV.—ON THE PREPARATION OF CHARCOAL BY HEATED STEAM.

An interesting and important paper on the above-named subject has recently been published by M. Violette, director of the powder works of Esquerdes, near St. Omer. It appears that the kind of charcoal best fitted for the manufacture of gun-powder is that which is prepared from the wood of the *Rhamnus frangula*, at a temperature below a red-heat. In this condition it has a brown, or reddish-brown, color, leaves a yellowish brown streak upon paper, and burns with flame when first kindled. It is quite brittle, however, easily reduced to powder, and is quite free from tarry matter. A more perfect and blacker charcoal than this *charbon roux*, makes inferior powder, being apparently more difficult of combustion.

In the ordinary processes for preparing charcoal, whether

by smothered combustion in a pile, or by destructive distillation in an iron retort, a large proportion is on this account always unfit for making gun-powder, from the impossibility of so regulating the temperature as to avoid passing the proper limit of carbonization, and producing black thoroughly-burned charcoal, fit only for fuel. MM. Thomas and Laurens first conceived the idea of applying highly heated and rarified steam to the restoration of animal charcoal which had lost its decolorizing properties, and the success of this process suggested to the author the propriety of applying the same agent to the direct carbonization of wood. The result was successful in every respect.

M. Violette first endeavored to determine the exact limits of temperature proper for producing charcoal of the best quality, by exposing small pieces of wood to the heat of a fusible metal bath, furnished with a thermometer. Below 570° Fahr., the heat was insufficient; between that temperature and 660° Fahr. (the highest range of the mercurial thermometer) excellent charcoal was produced, and beyond this, overburned or black charcoal only.

The first experiments with heated steam, made by means of a small apparatus capable of containing about two pounds of wood, were so encouraging, that permission was obtained to make arrangements for carrying out the process on a large scale. The apparatus now employed consists of two concentric horizontal cylinders of sheet iron, enclosed in a substantial brickwork erection, and having below a furnace whose principle office is to heat to the necessary extent the spiral coil of wrought iron pipe through which the steam is made to circulate before entering the cylinders. The outer cylinder is closed by an iron plate, which can be made tight by luting, in the manner of a coal-gas retort; and defended from the cooling influence of the air by an external cast-iron door. The charge consists of about sixty pounds of wood, which is placed in an envelope of perforated sheet-iron, capable of freely entering the inner cylinder of the

apparatus. The steam is admitted at a pressure of about fifteen pounds to the square inch above that of the atmosphere. After passing through the heated spiral pipe, it first enters the outer cylinder, passes through its whole length, gains access to the inner cylinder by its anterior open end, penetrates and carbonizes the wood, and finally escapes, together with the products of distillation from the latter by a tube provided for the purpose. The temperature is regulated by the aid of certain small vertical iron tubes, having their lower ends closed, which penetrate into the inner cylinder. These tubes contain portions of tin, lead, and an alloy of intermediate fusibility, by the melting of which the temperature of the cylinder is indicated with sufficient precision. The operation commonly lasts about two hours. When completed, the current of steam is stopped for a few minutes, the cylinder opened, and the perforated metal envelope containing the charcoal withdrawn, and immediately received into an iron extinguishing vessel, which is instantly closed and rendered air-tight. Without this precaution the charcoal would probably take fire on contact with the air. Another envelope, containing a fresh charge of wood, previously prepared, is then introduced into the apparatus, the cylinder closed, the steam admitted, and the operation in this manner indefinitely repeated. With moderate care and skill the product obtained consists almost wholly of *charbon roux,* absolutely free from tarry matters, and amounting to about thirty-six or thirty-eight per cent. of the weight of the wood; a quantity vastly exceeding that yielded by the old processes, which, as a mean, gave but fourteen or fifteen per cent. of the proper kind of charcoal, the rest being black from overheating, and unfit for making gunpowder.

M. Violette terminates his memoir by calling attention to several other important applications of heated steam. The waste steam which escapes from the apparatus just described, bearing with it the various products of destructive

distillation of wood, is easily condensed, together with many of these latter, which, differing in their nature with the stage of the operation, probably admit of being in some measure collected apart, and more easily isolated than when the whole are mixed up together. These products would admit of being, to a certain extent, regulated by the temperature applied, which is susceptible of perfect coutrol. The manufacture of acetic acid and wood-spirit might thus be disembarrassed from many of the difficulties which now attend it.

Bread and biscuit may be baked with the most perfect success by exposure for a very moderate time to a current of steam heated to 480° Fahr. The loaves so produced are particularly sweet and well-tasted, and their exposed parts covered with a gold-colored crust very pleasing to the eye. The biscuits, by proper management, are not only well-baked, but thoroughly dried, which in the preparation of biscuit for sea stores is a point of great importance. Strange as it may at first appear, steam, in the state spoken of, is a most powerful desiccating agent, inasmuch as it has a high temperature and a condition very far removed from its condensing point. Into such an atmosphere water will evaporate with the greatest facility, since the elastic force of the vapor present is very much less than that which would be possessed by steam of the maximum tension and density proper to the temperature. High-pressure steam has already been employed to heat baking-ovens, having been made to circulate around them within an outer envelope. To gain the necessary temperature, however, steam of great elastic force must be used, the employment of which is always inconvenient and often dangerous. These evils are entirely avoided, and the process itself facilitated by the use of a current of heated and rarified steam *within* the oven.

The desiccating powers of moderately heated dry steam might be applied to the rapid seasoning of deal and hard-wood, with perhaps less injury than the heated air of a

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stove. In chemical manufactories the distillation of substances of difficult volatility, and upon which water has no action, might be advantageously conducted in a stream of heated vapor.

On considering the application of heated steam, described or suggested by M. Violette, it will be apparent that one of the principal difficulties to be encountered lies in the construction of the heating-spiral, and that this difficulty will increase with the temperature which may be required. At the Esquerdes powder-works, the wrought iron tube described answered very well, the steam being heated by its means to about 600° Fahr. For temperatures much above this, however, there can be no doubt that the iron would be very speedily acted upon by the vapor of water, some portion of which would suffer decomposition, giving rise to hydrogen and oxide of iron. Cast-iron would probably be still more objectionable. Copper resists the vapor of water at a red-heat, but is rapidly destroyed by oxidation when exposed at that temperature to the air. Perhaps a compound pipe, copper within and iron without, might be found useful. This could easily be prepared by inserting a copper tube of the proper size into a long straight piece of stout wrought-iron barrel pipe, the whole being afterwards bent cold into a spiral in the manner practised with this kind of tubing. In this manner the iron would be shielded from the action of the water, and the copper from that of the air, and the advantages of both combined. It is needless to say that the steam must not be allowed to penetrate between the two tubes.

In connexion with this subject of the action of heated steam upon organic bodies, may be mentioned some curious observations by Mr. W. Ferguson, on the effect of steam at a temperature not exceeding 212° in apparently charring felt, which had been used for five or six months as a covering to a high-pressure boiler in which a temperature of 232° Fahr. was maintained. The charring took place at

places where small fissures in the boiler permitted the escape of steam, which, thus liberated, could not have a temperature exceeding 212°. Where no leaks existed, the felt in contact with the boiler remained unaltered. Another case was that presented by the wooden float-guage of a brewing-copper, which had been exposed during five years to the vapor and the saccharine solution, at a temperature of 215° or 216° Fahr. The apparently carbonized wood was found permeated by a soluble salt of copper, and the interstices were filled with octohedral and dodecahedral crystals of metallic copper, the effect of slow reduction by the organic matter. These cases, however, appear totally distinct from ordinary carbonization effected at a temperature approaching or exceeding the boiling-point of mercury, inasmuch as they required a very lengthened period of time. They more resemble the effects of those great operations of Nature in which coal and other bituminous substances have been produced by the action of water upon vegetable and other organic matter buried deep in the earth by the changes which take place upon its surface, and probably not exposed to a higher temperature than the depth at which they lie of necessity involves. The blackened and disintegrated wood and felt were probably in a condition more resembling humus than charcoal, and might have been found on examination soluble to a great extent in solution of potash.—*Pharm. Journ.*

ART. LXV.—OIL OF LAVENDER.

By Mr. Jacob Bell.

In the distillation of oil of lavender on the large scale, a considerable proportion of the stalk is not unfrequently thrown into the still with the heads of the flower. Sometimes the stalk is cut off with scissors almost close to the flower, in other cases less care is used and more stalk. The quality of the oil offered in the market varies very much, not only on account of occasional mixture with foreign oil, but even the genuine oil differs according to the circumstances under which it has been prepared.

The object of the following experiments was to ascertain to what extent the entire separation of the stalk would influence the quality of the result. The lavender florets were, therefore, stripped by hand from the stalk, which latter was carefully separated, so that nothing but the absolute floret should find its way into the still. The distillation was conducted in the usual way by steam. The quantity of water employed was about 30 gallons to the cwt. of flowers, the water coming over in each distillation being saved for the next, any deficiency being made up with fresh water.

The following table shows the quantity of flowers distilled on each of the occasions referred to, with the amount as well as the cost, of the product from each distillation.

	Pounds of Lavender Flowers.	Oil produced.	Cost per lb.
	lbs.	lb. oz.	s. d.
1846 July 28	99	1 7	64 0
" 29	113	1 15	53 4
" 31	116	2 4	52 0
Aug. 10	89	1 4½	61 4
1847.			
July 29	110	1 7	70 0
Aug. 4	161	2 11	53 4
" 6	217	3 12	53 4
" 9	145	2 3	58 8
1848.			
July 31	255	3 0	63 0
Aug. 2	217	2 8	61 0
" 4	306	4 0	57 4
" 7	80	1 2	32 0
" 8	66	0 15	31 3

The want of uniformity in the amount of product may be in part accounted for by the greater waste which occurs in operating on small quantities, by the variation in the condition of the flowers, and also in the proportions of fresh water added to that which had been used before. The price charged for the flowers separated from the stalk varied from 9*d.* to 11*d.* a pound. In the last two experiments the lavender was obtained in bundles, and two days were occupied by several boys in stripping the flowers. The cost of the labor must, therefore, be added to the result, in order to make a fair comparison; but even with this addition the expense is much less than it is when the flowers are bought stripped from the stalk.

The dealers will not put themselves out of their usual course unless they are well paid for their trouble; and as they are not usually called upon to supply the flowers without stalk, they seem to consider that they are conferring a favor by executing such an order, even at an exorbitant price. If the practice were more commonly adopted, arrangements would no doubt be made to supply the article on more reasonable terms.

Notwithstanding the increase in the cost of the oil obtained from the pure flowers, the improvement in the quality is sufficient to encourage a repetition of the practice. The oil is free from the rank smell which is often complained of in oil of lavender, and the experience of three years has confirmed the impression with which the experiment was undertaken. In further proof of the fact some oil was obtained by the distillation of the stalks alone, and this oil has in a remarkable degree the rank odor which is wanting in the oil from the flowers. Although this subject relates more to perfumery than to medicine, the distillation of oil of lavender is among the operations performed by the Pharmaceutical Chemist, and on the principle that whatever is worth doing is worth doing well, the above extracts from the laboratory journal are given for the purpose of establishing the fact, that those who aim at perfection in their oil of lavender should beware of the stalks.—*Pharm. Jour.*

ART. LXVI.—GUTTA PERCHA MEMBRANE.

For protecting the Skin against the Contagion of Animal Poisons.

By William Acton, Esq.

The author states that he has been engaged in performing various experiments with solutions of gun cotton, gutta percha and caoutchouc, with a view of testing their property of protecting the surface from the influence, by contact, of contagious poisons, and the following are the conclusions at which he arrived :—1. That a solution of gun cotton, when dry, corrugates the skin too much to be available for the purposes required. 2. That gutta percha alone is devoid of elasticity and sufficient adhesive quality, whilst the solution of caoutchouc wants body and is too sticky; but that, 3. The compound solution of caoutchouc and gutta percha possesses the requisite qualities to fulfil the purposes required. It is prepared by adding a drachm of gutta percha to an ounce of benzole, (the volatile principle of coal naphtha) and ten grains of India rubber to the same quantity of benzole, each being dissolved at a gentle heat, and then mixed in equal proportions. The author has employed this compound in painting the surface surrounding a chancre with the solution, and found that the acrid secretion had no effect upon it when dried, and warm or cold water may be applied with impunity. He considers that it may be employed advantageously in many and various ways, as in protecting the hands during *post-mortem* examinations, in preserving the cheek from excoriation in gonorrhœal ophthalmia, and in covering the parts contiguous to a sore where water dressing is the application, &c. A letter from Mr. Quekett to the author states the results of that gentleman's examination of these several solutions under the microscope. A dried film of the compound is described by him to be perfectly elastic and free from perforations, though in many parts less than the $\frac{1}{500}$ of an inch in thickness.—*Pharm. Jour.*

Editorial Department.

It was our intention to have noticed the report of Dr. T. O. Edwards upon Patent Medicines, in the last number, but as circumstances placed it out of our power to do so, we now refer to it as a document of too much interest and importance to be allowed to slumber among the things that have been. The Report was presented to Congress on the 6th of February, 1849, and originated in a resolution "ordering an inquiry into the expediency of so amending the patent laws as to prevent the patenting of compound medicines." It commences with the statement "that for many years a vast system of medical empiricism, sustained by popular credulity and the sanction of government, has prevailed in this country to the serious detriment of the public health and morals;" and it then goes on to point out the iniquity which, with an implied sanction of law, is perpetrated through this system. From the perusal of the report, the conviction to every one of common sense must proceed that every species of quackery is an imposition upon the public, but more especially that species which is sustained by enactments, which through its means have been prostituted to purposes never intended originally. The compounding of drugs can not be regarded as an invention; in accordance with science it is done with advantage, but the principles upon which such compounding rests are as well known and diffused as science itself, and no exclusive right can be set up to some lucky hit in combination, as usually stated in advertisements. It does, in fact, appear as if the genius of ignorance presided over these pretended revelations from the priests of Esculapius. Let us present a few samples, selected for their brevity from among the list of patents accompanying the report:

Anti-Bilious Pills.—"The following are the ingredients thereof, viz.: Pulv. gum scammony, one hundred and forty-four grains; *aloes*, one hundred and forty-four grains; rad. rhei, one hundred and forty-four grains; sap. venet., twenty grains; carb. soda, twenty grains; ol. caryophil, sixteen guttis; tr. *aloes* sufficient to form a mass, to be divided into one hundred and forty-four pills."

Medicine for Cure of Flesh Wounds.—"A vegetable extract, for speedily healing flesh wounds in the flesh of man or animals; also, scalds, burns, sore nipples, &c. The *extract* is obtained by *distilling* the bark, twigs, leaves and berries of the common *witch hazel* in the

usual mode of distillation, and may be preserved any length of time in well-corked bottles."

"Anti-Fever Pills.—Prescription thereof, viz.: Sulph. quinine, three ounces; rad. rhei pulveris, three ounces; piperinal pural, one ounce; acidum sulphuricum dilutum, (quantum sufficit,) formam massam. Make the above recipe into pills of three and a half grains each."

We have copied these beautiful excerpts literally; they certainly constitute a *genus* in the family of prescriptions. Yet it is to such productions of the human brain, that educated, scientific, skilful and high-principled druggists and apothecaries are lending themselves and assisting to reap a pecuniary profit.

While patentees are not afraid or too simple to conceal their ignorance, more cunning nostrum mongers, in comparative security from disclosure, continue their depredations on the public, and with swelling names and lists of certificates pander to the credulity of the community. We know an instance where a certificate, purporting to be written by a clergyman, was fabricated in a dry goods store in this city by the young gentlemen clerks as a literary relaxation.

At the present time, when the community are in a state of nervous apprehension with regard to one of the most fatal maladies known to mankind, we are sorry to see the avidity with which the dose-swallowing propensity is taken advantage of by some, from whose standing and tone in society we should expect better things. To relieve symptoms of incipient disease is one thing, but to administer medicine to every one who fancies himself sick is another, as wicked as it is pernicious. We know of a case where a gentleman from the West has absolutely injured his stomach by the quantity of anti-cholera medicines taken. One remedy we have met with purports to be the "Bombay Cholera Mixture," another, the "Western." Surely extremes meet.

We have little hope that nostrum selling will be interrupted, but the sanction of the government ought not to be given to medicines as crude and incongruous as those which are patented. We understand that Dr. Edwards has retired from the scene of his labors, where he has done much for the good of humanity in exposing abuses and staying imposition. May another leader, as zealous and talented, be found to succeed him. Had he continued to hold his place in the national councils, he would no doubt have been as successful in carrying the bill for the suppression of Patent Medicines accompanying the report, as he was in the case of the bill to prevent the introduction of Adulterated Drugs.

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ART. LXVII.—OBSERVATIONS ON COLLODION.

By Edward Parrish.

More than a year has elapsed since jointly with my friend W. W. D. Livermore, then an assistant in my establishment, I published an article in this Journal (vol. xiv., p. 181) upon the Ethereal Solution of Prepared Cotton, which I believe was the first essay on the pharmaceutical relations of this new and curious compound that appeared. The article had just been introduced to the notice of the profession in Philadelphia by Dr. Maynard, of Boston, one of the claimants for the honor of first applying it to surgical use. Up to that time, all that was generally known of its composition was that it was a solution in ether of fulminating cotton, prepared by the action of nitric and sulphuric acids on cotton.

A very few experiments convinced us that the ordinary commercial gun cotton manufactured by the patentees was nearly always insoluble, and that the directions for preparing gun cotton for explosive purposes were not those best adapted to obtain a good article for solution. After several trials we succeeded in producing an article identical in its properties with that of Maynard & Noyes, the agents of Dr. Maynard, but the formula we used, and which we then published, did not always give a satisfactory result; sometimes the cotton was found to be nearly or quite insoluble, at other times it dissolved rapidly and com-

pletely, but was destitute of any adhesive property, while at others it yielded a product completely answering the end desired. Under these circumstances the essay referred to was written, rather with a view to draw attention to the chemical and pharmaceutical relations of this new and interesting compound, than in the belief that our knowledge of the subject would justify an attempt to prescribe a perfect formula for its preparation, or fully to describe its properties and habitudes.

Having since prepared the collodion very frequently to meet a constant and increasing demand, and having observed particularly the precautions necessary to insure success, we have adopted the conclusion that the recipe then given, modified by changing somewhat the proportion of cotton to the acids, is the best adapted to its successful preparation of any that has been published. The formula of M. Mialhe, published in this Journal, (vol. xv., p. 42,) has been recently very generally adopted, as giving a more uniform and certain product, but we have found it to fail as frequently as the other, and to be much more inconvenient in its execution. It is impossible to make more than a very small quantity at one time, and the operator is exposed to the acid fumes while stirring the cotton with the semifluid mass, to a very inconvenient and even dangerous extent. The process of washing the product is also more inconvenient and tedious by this than by the preceding plan.

Having stated thus much, I will proceed to give the two formulæ, modified so as to correct the error in the proportion of cotton to the acids in the first, and what must have occurred to all who have used it, as an excess of prepared cotton to ether in Mialhe's; the latter has also been changed so as to adapt its phraseology to that of our officinal formulæ.

No. 1. Take of Fuming Nitric Acid, sp. grav. 1.48, and
Sulphuric Acid, each 4 fluid oz.
Cleansed and Bleached Cotton, ½ oz.
Sulphuric Ether, U. S. P., 4 pts.

Thoroughly saturate the cotton with the acids previously mixed, and allowed to become cool, and macerate for twelve hours. Wash the nitrated cotton in a large quantity of water, pick it out into thin layers, and dry it thoroughly by artificial heat; then dissolve it in the ether.

No. 2. Take of Nitrate of Potassa, thoroughly dried

and reduced to fine powder,	5 oz.
Sulphuric Acid (concentrated)	4¼ fluid oz.
Clean Carded Cotton, - -	15 grs.
Sulphuric Ether, - - -	2½ fluid oz.
Alcohol,	30 minims.

Mix the nitre with the sulphuric acid in an open glass or porcelain vessel, then add the cotton and agitate the mass by means of two glass rods for three minutes; then pick it out into a thin layer and dry it thoroughly by artificial heat; lastly, dissolve the prepared cotton in the ether, adding the alcohol.

By both these processes we have repeatedly made Collodion of excellent quality. We have also made it by a process more nearly resembling that of J. B. Edwards, published in the last number of this Journal, (which accidentally we did not see till since commencing this essay,) although the result of our experience is, that in order to insure the complete alteration of the cotton, it is preferable to macerate it for from six to twelve hours in the acids, and it is certainly less troublesome than the method of plunging it in very small quantities in the acids for the space of one or two minutes.

The following precautions, however, must be observed in its preparation in order to insure success.

1st. The nitric acid employed in No. 1 must be free from chlorohydric acid, a common impurity; it must be of the specific gravity named, or not less than 1.45. The officinal acid is 1.5.

2d. The sulphuric acid employed in both formulæ should be recently prepared, or if it has been exposed a consider-

able time to the air, should be boiled to free it from absorbed water. I have found the neglect of this precaution the most fruitful source of failure in making the preparation. The officinal acid has the specific gravity of 1.84, which is fully as strong as necessary.

3d. The materials and vessels employed in the process by either method must be dry. The ether must be undiluted with water. The presence of a small portion of alcohol facilitates the solution, though in excess it injures the product by rendering it less volatile. The officinal ether possesses the requisite proportion.

4th. In drying the prepared cotton, care should be taken to apply diffused heat to thin layers only, otherwise the part in contact with the heating surface will become dry before the remaining portion, and be very liable to take fire on any sudden elevation of temperature.

5th. Collodion must be put into vials previously dried, well stoppered either with glass or cork stoppers. In applying it, the parts should be carefully wiped to free them from moisture, and where a permanent plaster is desired, the solution should be repeatedly painted over the surface.

Collodion, as thus prepared, is a clear, colorless liquid, of a syrupy consistence, which, when applied to a dry surface, evaporates spontaneously, yielding a transparent plaster without whiteness, possessed of remarkable adhesiveness and contractility.

Composition of Collodion.

Notwithstanding the difference of opinion which exists as to the chemical nature of this body, it may not be amiss in this place to give some general statements on the subject, with a view to encouraging its further investigation.

There appear to be three substances produced by the action of nitric acid on cotton, *Xyloidine*, *Pyroxyline*, and *Etheroxyline*. *Xyloidine* was discovered by Bracco-

net in 1833, who first prepared it by precipitation from a solution of starch in nitric acid, by adding water; it is very soluble in ether. *Pyroxyline,* is believed to be identical with Schönbein's gun cotton, and is insoluble, or nearly so, in ether. *Etheroxyline,* is completely soluble in ether, with a small proportion of alcohol, and in solution is the substance recently named Collodion.

Whether these compounds are different in composition, or what are the circumstances which give rise to their different reactions, is a question which is yet to be determined. Prof. Schönbein asserts that pyroxyline differs from xyloidine in its being insoluble in acetic acid; while Bracconet maintains the identity of all the compounds of cellulose with nitric acid. Etheroxyline would seem to resemble it still more, though I have never yet met with an article perfectly soluble in ether which possessed the property of exploding without the least solid residue, which is the case with gun cotton of good quality. The existence of these three substances may perhaps account for the fact that our specimens of prepared cotton differ so much in their properties according to circumstances. When the nitric acid is too weak, it dissolves the cotton into an amorphous substance, extremely soluble in ether, but destitute of adhesiveness, which appears to correspond with xyloidine. When the acid is stronger, and contains an abundance of the nitrous acid fumes, we have either pyroxyline or etheroxyline, according as the action has been more or less violent, both having precisely the same texture and appearance, though differing in their solubility and in the completeness of their dissipation by heat.

Pyroxyline having been analyzed, is stated to contain—

Lignin, - - - - -	39.25
Nitric Acid, - - - -	60.75
	100

According to M. Porret, it is a hypo-nitrite of oxide of lignin. He states that he has isolated the oxide of lignin, which he calls *lignea*, and has discovered it to be an alkaline base, which neutralized by hypo-nitrous acid, produces a substance identical with gun cotton. The discovery of this base, if confirmed by future investigations, will be one of the most interesting of modern times, and may throw new light upon some of the phenomena of vegetable growth and decay.

Having already extended this essay beyond the limit intended, I shall pass rapidly over a consideration of some of the

Uses of Collodion.

In addition to the treatment of wounds and the application of bandages, for which it was at first principally recommended, it has since been applied with success to the treatment of burns, the worst cases of which will frequently recover with a single application of the solution, so completely and permanently is the surface protected from irritating causes. Superficial sores and abrasions of the skin are cured by painting them over with the solution. It gives great relief in tetter and various other skin diseases, especially when attended with violent itching. Prof. Simpson, of Edinburgh, recommends it for sore nipples, which it completely protects without interfering with the sucking of the infant. It is also found useful in the dressing of ulcers and of varicose veins, and in a variety of other surgical cases. In France, it is used to apply dressings of gold-beater's skin; and above all, as a substitute for dextrine in permanent splints, which, by its use, they are able to apply over a less extended surface without diminishing the strength and permanence of the dressing.

M. Soubeiran suggests its employment to render fabrics, particularly silk, impermeable to moisture, at the same time that they preserve unimpaired their color and softness. Of

such a fabric he suggests water-proof mantles might be made so light and compact as to be carried in the pocket, and drawn forth when required to protect the person and clothing from the rain.

In the last number of this journal will be found some excellent observations on the uses of collodion, by Chas. S. Rand. Its employment in connection with Venice turpentine as a varnish for labels, protecting them against the action of hot and cold water and alcohol, suggested by him, promises to be one of its most valuable applications.

In Pharmacy, collodion is used for coating pills, and as a vehicle for other external applications. The manner of coating pills is to dry them perfectly, and placing each pill on the point of a needle, to dip them into the solution, and withdraw them immediately, allowing them to dry, and repeating the operation. In this way, pills may be deprived of taste without detriment to their medical properties.

The following process is recommended by M. F. Ilisk, of St. Petersburg, for forming a convenient vesicant:

"*Collodium Cantharidal.*"

Take of	Cantharides - - -	1 pound.
	Sulphuric ether - -	"
	Acetic " - - -	3 fluid ounces.

Mix the ethers together, and treat the cantharides by the displacement process. Then to 2 fluid ounces of this tincture add 25 grains of prepared cotton.

This is to be applied by painting it over the parts.

ART. LXVIII.—NOTE ON INDIA CINNAMON AND RED SARSAPARILLA.

By J. Carson, M. D.

In our paper on India Opium, published in the last number of the Journal, we stated that specimens of several drugs had been put in our possession by Dr. Ruschenberger. Another of them is an article of Cinnamon, so unlike that which is ordinarily presented in commerce, and undescribed in the books, that a description of it may be interesting.

It is in bundles, composed of from 50 to 100 pieces of bark. Each piece is about ten inches in length, the form being that of a quill, or approximating to it; the strip of bark of which it is formed having been half an inch in breadth. Apparently the branches of the tree from which it was procured have been selected with a view to uniformity. The thickness is one line. It is constituted of the entire bark, both liber and epidermis. Externally it is of a light ash color, light and silvery looking in patches; little, or not at all wrinkled, but distinctly tuberculated. Internally it is of a deep brown, and smooth. On first view, it so much resembles in appearance the larger quills of fine Huanuco bark, as to be taken for it. The fracture is short; the odor exceedingly fragrant, and the taste is very warm, sweet and agreeable.

This species of Cinnamon is put up in Ceylon, expressly for the Canton market, where it is in high esteem, and commands a greater price than the ordinary kind. Its taste and flavor are preserved by the inner and outer layers of the bark being retained.

Red Sarsaparilla.

From the same source we have received a specimen of Sarsaparilla, which was given to Dr. R. by Dr. Burt, U.S.N. In the letter accompanying it, Dr. Burt says,—" I send you a specimen of Isthmus of Darien Sarsaparilla, said to be the genuine article by our Consul at Panama, who procured it

for me. It is known in common as Jamaica Sarsaparilla." From comparison, we can see no difference between the Sarsaparilla sent and the article known in commerce as Red or Jamaica Sarsaparilla. The locality from which the article is derived, we conceive to be satisfactorily settled by this communication of Dr. Burt, viz., the most southern part of North America.

ART. LXIX.—ON TINCTURE OF KINO.

Editors of American Journal of Pharmacy:

Gentlemen,—Appended to the formula in Wood and Bache's Dispensatory, for preparing Tincture of Kino, is the remark, that "This tincture very frequently becomes gelatinous, and at length loses almost entirely its astringency;" and "until some mode is discovered of obviating this evil, the tincture seems scarcely to be a proper object of officinal direction." Having had repeated occasion to regret the existence, long continued, of the above deficiency in our knowledge of the mode of preparing this tincture, I instituted some experiments with the view of ascertaining the means of remedying the defect. The result was the discovery of the fact, that, by making the preparation with *Proof Spirit*, instead of rectified spirit, as ordered in the Dispensatory, I obtained a tincture which *keeps perfectly well, is more astringent, and less stimulating* than we have before been able to obtain it.

On subsequent investigation, I discovered that an error had been committed in transferring the London formula to the pages of the Dispensatory, by construing "Spiritus Tenuior," which is ordered in the original, as "Rectified Spirit," and hence the defect.* The Dublin College also

*We have not a copy of the London Pharmacopœia at hand, but all the English books we have referred to, quoting that authority, direct Kino and Rectified Spirit as in the U. S. Dispensatory. We have some observations to offer on this subject, but will take advantage of a future occasion to present them.—Ed.

prescribes proof spirit, and Pereira asserts that this tincture does not spoil, to his knowledge, when prepared with good kino, noticing, at the same time, the observation I have quoted, and attributing the circumstance to the probable employment of an inferior article, overlooking the plain fact of the difference in strength of the spirit used. Without entering into any disquisition as to the *rationale* of the advantage of the difference in the menstruum recommended to be used in the preparation, I will merely submit the fact to you, which I have tested by a year's trial, and which seems to me to be of sufficient practical importance to entitle it to a place in your Journal, through which it may be the means of restoring to general use a valuable preparation for which we have no exactly adequate substitute.

I am, gentlemen, very respectfully,

BENJ. CANAVAN.

699 *Broadway*, *N. Y.*, Aug. 31, 1849.

ART. LXX.—TINCTURA SAPONIS CAMPHORATA.

By GEORGE ROSS, M. D.

VARIOUS suggestions have been given of late, as regards the best mode of making this preparation. I have met with the same difficulties, owing to its coagulation in cold weather, and hence, for some time past, have substituted the following, in lieu of the officinal preparation:

℞ Alcohol, - - - -	O.v.
Castor oil, - - -	℥iv.
Water of ammonia, - -	℥iv.
Camphor, - - -	℥iv.
Oil of rosemary, - - -	℥j.

Mix the castor oil and water of ammonia together, then

add the alcohol; digest for twelve hours; then filter, and add the camphor and oil of rosemary.

The castor oil and ammonia make a soap soluble in alcohol. It forms a transparent liniment, yellowish in color, and will not coagulate in cold weather. And it always gives satisfaction to the consumers of it.*

REVIEW.

ART. LXXI.—CHEMICAL TECHNOLOGY OR CHEMISTRY APPLIED TO ARTS AND MANUFACTURES: By DR. F. KNAPP, Professor at the University of Giessen. Translated and edited with numerous notes and additions, by DR. EDMUND RONALDS, Lecturer on Chemistry at the Middlesex Hospital, and DR. THOMAS RICHARDSON of New-Castle-on-Tyne. First American Edition, with notes and additions, by Professor WALTER R. JOHNSON of Washington, D.C. Vol. 2d. Illustrated with 246 engravings on wood. Philada.: Lea & Blanchard, 1849. pp. 432.

IN the Journal for October, 1848, will be found a notice of the first volume of this work, which has subsequently been completed by the issue of the second. In that notice the general scope and value of the work were pointed out, with a brief review of the several topics to which the volume was devoted. The present continues them, embracing the subjects of Glass making, Alum manufacture, Copperas manufacture, Clay wares, China ware manufacture, Stone ware manufacture, Bricks, Lime, Gypsum and Magnesia. Most of these subjects are of importance and interest to the pharmaceutist, and we conceive we shall be performing a useful task in presenting such information, derived from this work, as will aid and abet him in his profession.

* However good a preparation the above may be, it evidently should not be substituted for the officinal, when the latter is prescribed.—ED.

With respect to the subject of glass, strong as may be the declaration of the author, yet all must at the present time be prepared to accord with it, and agree that "it is next to certain that the rapid development of those sciences which are based upon accurate observation and experiment, such as Astronomy, Natural Philosophy, Chemistry, and Physiology could never have taken place without the knowledge of glass and its applications."

The first part of the chapter upon glass, is devoted to the composition of this substance, after this follow the properties of the article and formulæ for making the different varieties. Glass is not a fixed substance, as by many imagined, but a chemical compound varying in ingredients and in the proportion of them; potassa, soda, lime, oxide of lead, iron, manganese, &c., as well as silica enter into the formation of the article, the properties of which must vary accordingly, or from the mode of treating the ingredients. As for pharmaceutical and chemical purposes, a glass is essential which will be least acted upon by the agents manipulated with, the importance of selecting the right kind, from a knowledge of the difference in varieties, becomes apparent. Our author states, that "under all circumstances, and when every precaution is taken in the manufacture, it is still impossible, as far as observation has shown, to obtain a glass which is practically incapable of being attacked."

"Pure, finely powdered glass taken from a tube or window pane and moistened with water, has been shown by Faraday and Bischoff to exhibit an alkaline reaction; salammoniac precipitates flocculent silica from this solution, according to Fuchs. The same reaction occurs, according to Dumas, when water is boiled for some time in a glass vessel, and a troubled appearance arising from insoluble silicate of lime, is occasioned at the same time. Griffiths extracted 7 per cent. of potash from flint-glass powder, by boiling it for weeks together with water, and repeatedly

re-grinding and washing it. Hence it follows that ordinary glass cannot entirely withstand the action of water; although the influence exerted by this agent is comparatively unimportant and much less perceptible when the glass is not in the state of powder, and its natural surface is unimpaired. The best window panes, however, cannot altogether resist the action of the weather and the rain. The alkali is gradually extracted by atmospheric moisture and washed away, whilst a very thin layer of silica or of silicate of lime remains upon the surface, and exhibits a play of prismatic colors. The external coating, exhibiting the lustre of mother of pearl, with other relics of antiquity, was found by Griffiths to be pure silica. An observation of Colladon is very remarkable and difficult of explanation, who found pieces of glass taken from an old pit, 12 feet deep, both flexible and so soft that they could be kneaded and cut with a knife; glass of this kind, however, regained its hardness and frangibility by exposure for several hours to the air.

"Acids naturally extract potash, soda, and lime, with much greater ease from glass, with the separation of gelatinous silica. Caustic alkalies exert an opposite action upon glass by dissolving its silica. A like effect has been attributed to ammonia, and thence it has been explained, why the panes of glass in stables are particularly liable to become coated with a thin layer exhibiting the play of colors mentioned above. Glass which contains oxide of lead is liable to blacken on exposure to air containing sulphuretted hydrogen, by the formation of sulphuret of lead; and when heated in a flame, the oxide of lead is frequently reduced, and blackness is produced by the metallic lead.

"The action of hydro-fluoric acid, the most powerful agent for the decomposition of glass, is quite peculiar. Glass is completely disintegrated by this acid with the formation of fluosilicic acid and double compounds of fluoride of silicon with the fluorides of potassium, fluorides of sodium, and fluorides of calcium, &c."

White hohl-glass is the kind which has been designated as *medicinal glass.* The following information will be nteresting.

White Hohl-Glass.

"*Composition.*—The following instances of composition may serve as general standards:

FOR APOTHECARIES' PHIALS.	SEMI WHITE.	CLEAR WHITE.
100 lbs. of white sand	100 lbs. sand	100 lbs. sand
30 — 35 " potashes (impure)	100 " crude soda containing lime	65 " calcined potashes
17 "		6 " fallen lime
110 — 120 " ashes	100 " cullet	100 " white cullet
$\frac{1}{4}$ — $\frac{1}{2}$ " perox. manganese (cullet.)	$\frac{1}{2}$ — 1 " manganese.	$\frac{1}{8}$ " manganese.

BOHEMIAN CRYSTAL FOR GRINDING.		WHITE GLASS FOR CHEMICAL PURPOSES (*Solintass*)
100 lbs. white sand	100 lbs. sand	100 lbs white sand
0 — 60 " purified potashes	30 " potashes	41.4 " potashes
8 " chalk	18 " lime	17.5 " lime.
40 " broken glass	discolorizing matters.	
$\frac{1}{4}$ " m nganese.		

"These examples will suffice to show the general character of white hohl-glass, viz., that it is composed of purer materials, which are as free from iron and alumina as possible, with the use of discolorizing matters. A complete process of fining is always carried out, whatever may be the differences in the composition, rendered necessary by the various applications of the substance. Glass for chemical purposes must combine transparency and perfect absence of color, with the property of being difficultly decomposed, although this is of minor importance for other applications A few additional instances will prove that the working operations are essentially the same as those already described, and will show some of the expedients that are had recourse to under particular circumstances.

"*Mechanical Operations.*—One of the simplest cases is exhibited in the blowing of a flask, Fig. 22. According as the blast is kept up with more or less force during the swinging operation, the neck will be more extended or more cylindrical. Before blowing out the globe, the glass below is re-heated, but not that above, which is to form the neck; if the revolving motion is stopped, the pipe having a downward direction, before the globe is completely

formed, and the pipe is inverted into the position represented in Fig. 23, the belly sinks below the axis of the neck of the flask, and a retort is formed; no indentation occurs, as the constant blast keeps up the pressure of air in the interior.

Fig. 22.

Fig. 23.

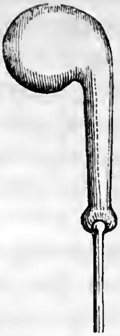
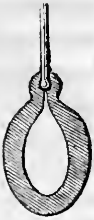


Fig 24.



"When a hollow lump of glass, for instance a globe, is drawn out whilst hot, the cavity in the interior is always preserved, and even when the drawing process is carried to its utmost limits the thread of glass appears under the the microscope in the form of the finest capillary tube. Upon this depends the process of tube-drawing in the glass-houses, for which operation two workmen are required. Whilst one man collects the necessary quantity of glass on his pipe, and blows this out to a very massive globe, preserving a uniform thickness of the sides as much as possible, Fig. 24, the other attaches a drop of glass to a punty-rod, and warms it in the fire by the side of the globe. Both instruments are then removed from the fire at once, and the punty-rod is pushed forcibly against the globe in such a manner as to form exactly a straight line with the pipe

Fig. 25.

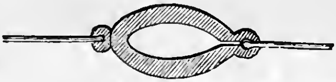


Fig. 26.

as represented in Fig. 25; this being accomplished, one of the workmen retires backwards as quickly as possible to the distance of 50, 60, or 100 feet. In this operation the

globe shrinks at first, as is represented at *a* in Fig. 26, and forms the commencement of the tube, which soon cools and does not diminish in thickness, whilst the mass of glass is spun out by the constant drawing from the warm end at *b b*. Constant rotation of the pipe and punty-rod is here as necessary as in all the other operations in glass blowing, or the part of the tube nearest the ground would cool quickest, and the tube thus assume an irregular form. This, however, does not prevent the tube, in consequence of its great length, from sinking in the middle like a stretched rope, and it becomes, consequently, thicker at the two ends, as is represented in Fig. 27. The curve in the tube is, however, remedied by placing it on the ground before it has become perfectly set, it then straightens, and is cut into lengths of 4 or 6 feet each, by taking hold of it with a pair of cold tongs. Tubes cool very uniformly, in consequence of their small amount of metal, and they are, therefore, not placed in the annealing oven. Lastly, the bore of the tube is dependent upon the length to which a given mass of glass is stretched, or the length being the same, upon the mass of glass. The stoutness of the tube is, however, determined by the thickness of the sides of the original globe, as the relation between the thickness of the sides and the bore is not altered by drawing. Wide, thin tubes (such as are used for spindles, &c.) must, therefore, be drawn out of a large thin globe, and *vice versâ*: it is necessary, however, whilst the tubes are drawing, to blow into them, that the sides may not sink in."

Fig. 27

As optical-glass is an exceedingly important variety of this substance, the account of its formation contained in this work will be found interesting. Besides its economical and scientific application, we are so much indebted to this article of manufacture for ornament and luxury, that in these points of view, it is of the highest importance. Curiosity will be amply re-

paid by perusing the pages which point out the various ways of producing those beautiful forms which adorn our houses, are produced at our entertainments, or, by every day use, contribute to our comfort.

The chapters on Alum and Copperas contain full information on preparing these substances important to the arts and manufactures; connected with the latter is the mode of producing the fuming oil of vitriol, which is pursued at Radnitz.

Porcelain is another subject important to the pharmaceutist this, with the various preparations from clay and bricks, constitute an interesting and full chapter.

The two concluding chapters are appropriated to lime and magnesia; connected with the latter are two substances used in medicine, the carbonate and sulphate. We take the liberty of inserting what the author says of the latter.

Sulphate of magnesia is procured from

"*Natural Solutions.*—This salt is found in sea water, in several salt springs, and even in ordinary wells. The oldest source whence it is procured is that of Epsom, in Surrey, from whence it acquired the name of 'Epsom Salts.' It also occurs in the springs at Saidschütz, in Bohemia, and as an efflorescence in many localities, termed Hair Salts by mineralogists.

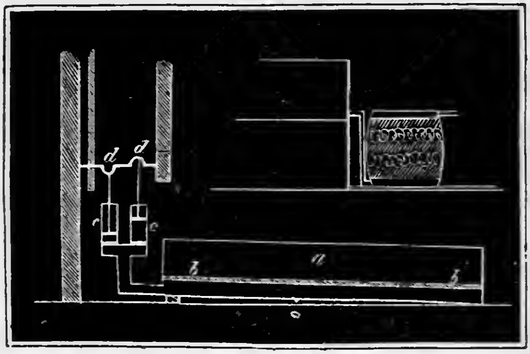
"It is procured from these bitter springs by simple evaporation and crystalization, but in such cases it is always contaminated with some chloride of magnesium. The same simple process is employed in some places to obtain it from the mother-ley after the common salt has been extracted from sea water, in which cases the sulphate of soda and chloride of magnesia are mutually decomposed, yielding common salt and sulphate of magnesia.

"*From Shale.*—It is also obtained in the neighborhood of Genoa from a shale containing magnesia, and the sulphurets of iron and copper. The shale is roasted and exposed to the action of the weather, which facilitates the oxidation of

the sulphurets. The magnesia abstracts a considerable portion of the sulphuric acid so formed, and the whole mass is then lixiviated. The copper is precipitated from the liquid by pieces of iron, and the iron is afterwards thrown down by the addition of milk of lime. The sulphate of magnesia is procured by boiling down the residual liquors and crystalization. The sulphate of magnesia obtained in this way is, however, never free from the sulphates of iron and copper.

" *From Magnesian Limestone.*—In this country, the sulphate is sometimes manufactured directly from magnesian limestone and sulphuric acid, in conjunction with other products. The carbonic acid produced by the action of the sulphuric acid is employed in the manufacture of bicarbonate of soda, already described at p. 296, vol. i., while the mixed sulphates of lime and magnesia are thrown into large wooden vessels *A*, Fig. 244, which are fitted with a

Fig. 244.



false bottom *b b*. Water is now poured upon the thick mass and drawn through by the action of a pair of pumps *c c*, worked from an engine shaft in any convenient manner, as shown at *d d*. In this way, the whole of the sulphate of magnesia is extracted with the least expenditure of water; and the solution, after being pumped into a reser-

voir, is allowed to filter through layers of sandstone and charcoal to render it clear and bright, as shown in the sketch, Fig. 244, at *B*. The solution is now concentrated by evaporation, and made to crystalize as rapidly as possible, in shallow wooden troughs lined with lead, in order that the crystals may be as small as possible to meet the prejudice of the trade in this respect. The sulphate of lime left on the filter or false bottom *b b*, is worked up in the manufacture of Venetian red.

"The process, however, which is more generally pursued is as follows:

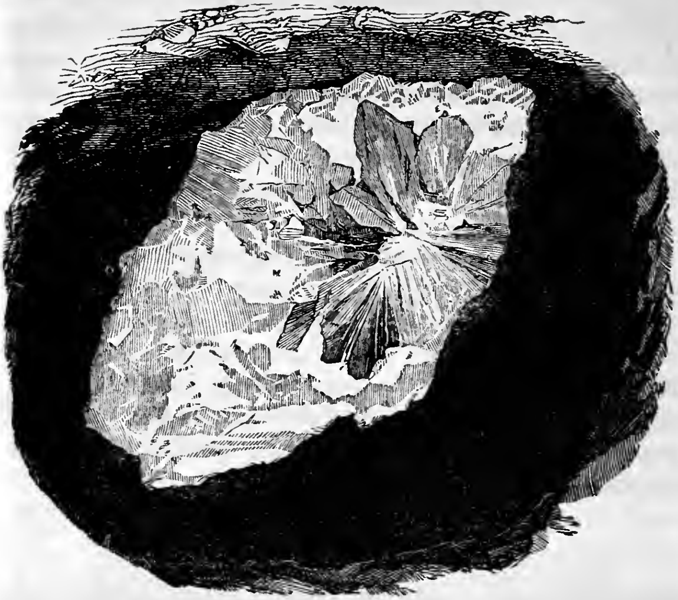
"Magnesian limestone is calcined in an ordinary lime-kiln, and repeatedly washed with water to remove as much of the lime as possible. The extent to which this is carried may be inferred from the following analyses of a sample of limestone in its natural state, and after it had been calcined and washed:

Natural.		*Washed.*	
Carbonic acid, &c. -	47.12	Water, &c. - - -	32.54
Lime - - - - - -	27.49	Lime - - - - -	7.34
Magnesia - - -	22.22	Magnesia - - -	44.41
Insoluble matter, alumina, &c.	3.17	Insoluble matter, alumina, &c.	15.74
	100.00		100.00

(Richardson.)

"The limestone selected by the manufacturer for this purpose is soft, and similar to that known as *flexible;* such samples as have the appearance shown in the sketch (Fig. 245) do not usually contain so much magnesia.

Fig. 245.



"*From refuse Alum-liquors.*—In the manufacture of alum as conducted near Whitly, the "salts'-mothers" contain in the gallon :

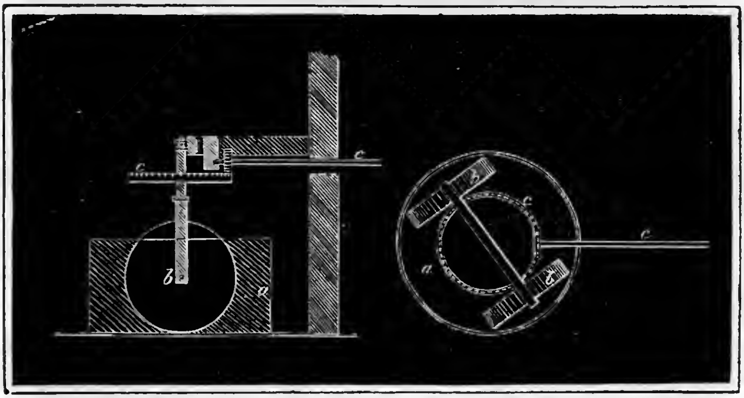
Sulphuric acid (free - - -	2697.61
Sulphate of magnesia - - -	8910.40
Sulphate of alumina - - -	852.24
Sulphate of potash - - -	3693.32
Sulphate of manganese - - -	106.60
Sulphate of nickel and cobalt -	traces
Sulphate of iron - - -	3026.67
	grs. 19286.30 (Richardson)

which by crystalization produces a crude sulphate of magnesia, called "Rough Epsoms," which has the following composition :

Sulphuric acid - - - -	32.26
Magnesia - - - -	15.35
Protoxide of iron - - - -	1.73
Oxides of nickel and cobalt - -	0.12
Lime - - - -	0.09
Alumina - - - -	1.33
Potash - - - -	0.83
Water - - - -	48.29
	100.00 (Richardson.)

These rough Epsoms are mixed with the washed magnesian lime in such proportions that all the sulphuric acid, except that in combination with the potash and magnesia, is taken up by the free magnesia and lime. The mixture is then calcined in an ordinary reverberatory furnace, at a dull red heat, which assists the transfer of the sulphuric acid, and raises the metals to a higher degree of oxidation, thereby ensuring their insolubility. The calcined product is afterwards thrown into a large circular cistern *a*, Fig. 246, filled

Fig. 246.



with water, and in which a pair of edge-stones *b b*, is made to revolve by suitable machinery *c c*. By this arrangement, the large pieces are ground to powder, while the agitation produced by the motion of the edge-stones facilitates the solution of the sulphate of magnesia.

"The sulphate of magnesia liquor is subsequently clarified in the manner previously described, and crystalized in the usual shallow pans. When the liquid has drained off from the crystals, they are removed to a stone and dried at a low temperature. In this dry state, they are thrown into a species of temse, which reduces still further the size of the crystals, and renders the whole of a more uniform appearance.

"*From Bicarbonate of Magnesia.*—Mr. Pattinson has also patented the application of his bicarbonate of magnesia solution for the production of sulphate of magnesia, which he effects by employing either sulphuric acid or its equivalent quantity of sulphate of iron, heating to the boiling point, and separating, in the latter case, the precipitated carbonate of iron by subsidence, and then crystalizing.

"*From native Carbonate of Magnesia.*—Mr. Chance has lately imported a very pure, natural carbonate of magnesia from the Mediterranean, to which he adds sulphuric acid, and proceeds in the usual way for the production of this sulphate; and having, it is understood, secured the entire produce of the mine, he is likely to become a formidable competitor to the other manufacturers.

"Another article is manufactured to some extent which requires a passing notice here, viz., what are termed "Mock Epsoms," which is simple sulphate of soda crystalized very rapidly in shallow vessels for the purpose of adulterating the genuine article.

"The sulphate of magnesia crystalizes in right prisms, which at 60° Fahr. are soluble in their own weight of water. When exposed to the air, they effloresce and are reduced to powder. This salt has the well-known intensely bitter taste; and is composed of

Magnesia - - -	16.26
Sulphuric acid - -	32.52
Water - - -	51.22
	100.00"

In concluding our notice of this work we cannot avoid noticing the beautiful manner in which it has been gotten up. The new style of wood engravings are peculiarly adapted to set off the pages, and by their clearness to illustrate the processes described. To the practical man in the various departments of arts described by it, the work cannot prove otherwise than useful.

ART. LXXII.—CHEMICAL FACTS APPLIED TO PHYSIOLOGY.

By M. Barreswil.

The following are the conclusions arrived at by the author:

1. That the white of the egg of the common fowl contains sugar.

2. That the white of egg is alkaline, and that its alkalinity depends upon carbonate of soda.

3. The yolk of egg contain little or no alkali; its emulsive properties in all cases depend, not upon the alkali, but upon a product analogous to that existing in the pancreatic juice.

4. The yolk of egg is not acid, but becomes so in consequence of having undergone a change.

5. The acid reaction and the properties of the gastric juice are produced by organic acids, and not muriatic acid.

6. The alkali and sugar of the white of egg may disappear, mutually destroying each other, even during the experiment made for their demonstration; and thus the discrepancy in the results obtained by the difference of the methods may be explained.

7. The change in the albumen of the egg, and in all analogous matters, is more rapid in proportion to the dilution of these matters; and the cause of the greater or less rapidity in the change is owing (all other conditions being the same) to the circumstances which favor more or less the solution of the ferment.—*Chem. Gaz., from Comptes Rendus.*

ART. LXXIII.—ON HYDRATED VALERIANATE OF ZINC.

By G. C. Wittstein.

The valerianate of zinc, obtained by precipitating sulphate of zinc with valerianate of soda, or by evaporating the aqueous solution, is anhydrous. If, on the contrary, carbonate of zinc is stirred with so little water as to form a paste, it is converted, upon the addition of the calculated quantity of valerianic acid, into a hydrated salt with 12 atoms of water. This salt, when dried at 122°, perfectly resembles the anhydrous salt. It parts with its water at 212°, and dissolves in 44 parts of water. The solution, on being heated, becomes turbid, but bright again on cooling. When boiled so long that the whole of the sediment does not redissolve on cooling, the residue is the anhydrous salt. The analysis of the hydrated salt dried at 122° furnished—

Oxide of zinc	17·00	1	16·94
Valerianic acid	38·58	1	38·42
Water	44·42	12	44·64

Ibid, from Buchner's *Rep.*

ART. LXXIV.—METHOD OF SOLDERING CAST IRON WITH WROUGHT IRON.

The following process has been recommended for this purpose:—First melt filings of soft cast iron with calcined borax in a crucible; then pulverize the black vitreous substance which is thereby produced, and sprinkle it over the parts which are intended to be united; after which heat the pieces of wrought and cast iron and weld them together on an anvil, using only gentle blows. This method is peculiarly applicable for the manufacture of iron articles which are intended to be made red hot, and are required to be impervious to fluids and liquids, as such a result cannot be obtained by simple fastening.—*Newton's Journal.*

ART. LXXV.—SOME OBSERVATIONS ON CHLOROFORM.

By Messrs. Soubeiran and Mialhé.

Two liquids are sold in commerce under the name of chloroform, which, although of very different origin, have nevertheless been hitherto considered as identical, and substituted one for the other. However, they exhibit some remarkable differences in their properties; the one derived from the action of hypochlorite of lime upon alcohol possesses all the characters which have been assigned by one of us to chloroform, and which we shall therefore call *normal chloroform;* the other, obtained by the action of hypochlorite of lime on pyroxylic spirit or methylic alcohol, differs so much from the first that we were induced to submit them to a careful comparative examination to ascertain the cause of this difference.

The chloroform from pyroxylic spirit, which we shall call for convenience *methylic chloroform*, although possessing the same physical appearances as the normal chloroform, has quite a different odor; it is not sweet and agreeable, but empyreumatic and nauseous. Its density is less than that of ordinary chloroform; the latter weighs 1·496, whilst the specific gravity of the former is only 1·413.* Its boiling-point likewise appears to be lower; and lastly, the inhalation of the methylic chloroform, far from being agreeable and pleasant, produces a general feeling of sickness, followed by a heaviness in the head, and sometimes by vomiting.

These differences led us to believe that they did not possess the same composition, or that the properties of one of

* We may observe that the density of chloroform, fixed by M. Liebig at 1·480, is too low; we have constantly obtained 1·496 at 54° for a perfectly pure chloroform. This difference undoubtedly arises from the presence of a foreign substance which had not been separated from the chloroform, as we shall presently show.

them were masked by some foreign substance. On the first hypothesis, it might be imagined that the chloroform, which does not belong to the same chemical type as alcohol, and which is produced by the profound disturbance caused by the action of chloride of lime, might prove to be a different substance according as it resulted from the action upon alcohol, which belongs to the ethylic series, or from the reaction on wood-spirit, which belongs to the methylic series. It might also happen that the difference was owing to a weaker or stronger condensation of the methyle, supposed to exist equally in the two chloroforms. To decide this, we undertook some analyses, the result of which will be given subsequently. The second hypothesis supposes the identity of the chloroform, whether it has been formed from alcohol or from pyroxylic spirit; the difference in this case would arise from the presence of a foreign substance. This opinion is better founded; in fact, on attempting to rectify methylic chloroform by successive distillations over chloride of calcium, we found that the salt forming the residue retained after each distillation a certain quantity of a peculiar oil, which was easily isolated by washing with water. By repeated rectification, we were able to obtain a considerable amount of this oil, the proportion of which rose to as much as 30 grms. in 500 in some commercial chloroforms.

This new substance is liquid and of an oily consistence. At first yellowish, it is rendered colorless by a simple rectification; it has a very peculiar and very strong empyreumatic odor, similar to that possessed by the methylic chloroform; it is lighter than water; it began to distil at 185°, but gradually rose to 271°. This rise of temperature during the distillation evidently indicates a mixture of different compounds. It readily took fire, and burnt with a very intensely smoky flame. The presence of chlorine among the products of its combustion, indicated that this body formed a constituent part.

Although rectified several times, the chloroform which had yielded this oil still retained the characteristic empyreumatic odor. We therefore sought for some chemical reagent, which, without acting upon the chloroform itself, should either separate or destroy the oil it still contained. After some experiments, concentrated sulphuric acid appeared to us most suitable; it produced in the impure chloroform a brownish-red color, which was the more intense the more oil was contained in the mixture. This color, which it likewise produces in a far higher degree with the isolated oil, is due to its carbonization; so that on distilling impure chloroform with a certain quantity of concentrated acid, we succeeded in obtaining a product which was no longer colored by this powerful reagent, and possessed no empyreumatic odor.

We were then able to analyse the chloroform thus purified, and to examine its properties compared with those of normal chloroform. Composition, boiling-point, density in the liquid state and in the state of vapor, were all found to be perfectly alike; and we were able to assure ourselves that there exists but one chloroform, and that that derived from wood-spirit does not differ in the least from the chloroform from alcohol when the precaution has been taken to separate the whole of the oil above-mentioned. However it must be stated that the complete separation of this oil was not effected; there still remained a minute proportion, so small indeed as to have no influence either on the specific gravity or on the results of the analysis; but it was evident, from the odor which remained after evaporating a sufficiently large quantity of chloroform; and likewise the vessel used to take the density of the vapor, still perceptibly retained the peculiar odor of this chlorinated methylic oil. It is almost impossible to remove the last traces of it; they resist the action of concentrated sulphuric acid even after long-continued contact.

There are therefore not two kinds of chloroform; but the presence of a peculiar oil, produced in the action of chloride of lime upon pyroxylic spirit, is the cause of the differences which they present at first sight. Having established this fact, we now enquired whether during the preparation of chloroform from alcohol a substance analogous to that just described was not produced. Our suppositions were confirmed by experiment. The crude chloroform was first washed with water, then with carbonate of soda, left for a long time with chloride of calcium to remove the water; and lastly, filtered and distilled in a glass retort in a water-bath. There remained in the retort an aromatic liquid, but of an odor different from that of chloroform; but the amount was very small, being not 40 grms. from 20 kilogrammes of chloroform.

This oil differs essentially from that obtained from the chloroform prepared with pyroxylic spirit; it is heavier than water, and has a peculiar acrid penetrating odor, totally different from that of the other. On attempting to determine its boiling-point, we found that, like the former, it consisted of a mixture of different compounds; for the thermometer, which stood at 154° at the commencement of the ebullition, rose to 243°, and the temperature would undoubtedly have risen still higher had a larger amount been at our disposal. All these compounds contain chlorine, as was evident from an examination of the products of their combustion. Although these different substances were not submitted to analysis, everything leads us to believe that they are intermediate in composition between chloroform and one of the known chlorides of carbon.

It is scarcely possible to decide by what reaction these chlorinated oils are produced, no organic analysis having been made; we may however observe, that in the preparation of chloroform from ordinary alcohol, the more chlorinated oil is formed the less chloride of lime is added to

the mixture, or that the production of the substance is due to an excess of chlorine.

It results from what precedes, that the chloroform obtained from wood-spirit should not be employed for inhalation, it being impossible to deprive it entirely of its empyreumatic odor; it might be used for liniments, after having been previously rectified over sulphuric acid and chloride of calcium; but the necessity of these rectifications destroys the advantage which might arise from the substitution of pyroxylic spirit for alcohol.

The presence of the chlorinated oil, however small in quantity, even in the chloroform obtained from alcohol, has a very decided influence on the use of this substance. It is to it that must be most frequently attributed the sickness and vomitings caused by the inhalation of chloroform. It is therefore absolutely requisite to distil the chloroform, in order to separate the foreign substance which it contains; and this distillation should be stopped shortly before the end of the operation, in order not to re-form the mixture. The oil contained in the residue then possesses in the highest degree the property of producing headache and giddiness; its action upon the system certainly requires that its physiological effects should be studied.

In conclusion, we may draw attention to a physical property of chloroform, which appears not to have been previously noticed; it is its solidification by spontaneous evaporation. When chloroform is poured upon a double filter of bibulous paper, a great portion of the liquid, from its heaviness and fluidity, quickly passes through the paper; whilst another portion, evaporating rapidly upon the margins of the filter, produces so much cold as to congeal it into white silky scales, which keep a few instants.—*Chem. Gaz. from Journ. de Pharm.*

ART. LXXVI.—MEANS OF DETERMINING THE PURITY OF THE OTTO OF ROSES.

By M. Guibourt.

The high price of this article renders it a matter of great importance to be enabled to decide upon its purity. The following means, if used in combination, will leave no doubt upon this point.

The physical characters can be but little depended upon; thus, the yellow color with a tinge of green and its point of congelation may be readily imitated. Its odor also is so powerful, that a certain quantity of any other oil of a somewhat similar odor might be added without sensibly diminishing that of the otto. The manner in which it crystallizes is of a certain amount of importance. When, after having been liquefied by a gentle heat, it is allowed to cool slowly and at rest, it remains as it were transparent, in consequence of the thinness and the perfect transparence of its long and pointed crystals, which resemble the blades of daggers; and on varying their position as regards the light, these laminæ reflect all the prismatic colors. When the otto of roses has been adulterated with any uncrystallizable oil, which requires that its property of congealing should be imparted by the addition of spermaceti, it presents, when solidified, a number of fine needles, which, however, are not transparent, but render the mass uniformly semi-opake. But for this test to be of any value, the otto must be allowed to crystallize slowly and at rest; otherwise it becomes nebulous and opake, like that which has been adulterated.

The oil most frequently used for its adulteration is that of several species of *Pelargonium*. The oils derived from the different species cannot be all identical, since M. Recluz has described one which is solid, whilst that which is met with in commerce is always liquid. The oil which I em-

ployed for comparison is called oil of *Geranium*, and came from Nice. I also examined some oil of rose-wood, which was distilled at Paris some years ago, and some of that found in commerce. Three re-agents will serve to distinguish the pure otto—iodine, nitrous acid vapor, and sulphuric acid.

Test with Iodine.—A small quantity of iodine is placed in a small glass vessel with a wide mouth; around it watch-glasses are arranged, each containing one or two drops of the oils under examination, and the whole is covered with a bell-glass. At the end of a few hours the vapor of the iodine is found to have condensed upon every part of the interior of the bell-glass, and upon the glasses containing the oils; but the margin of the watch-glasses containing the substituted oils is much more colored than that of the glass containing the otto; and when the former oils become brown, the latter retains its natural color. After some hours the vessel containing the iodine may be removed; and then, the effect still continuing, the otto remains white, whilst the other oils become perfectly black. On exposing the watch-glasses to the air, the iodine which has condensed upon the margin of those containing the otto is volatilized, and the glass becomes almost colorless, whilst the others retain their black color. I am satisfied that this test will serve, not only to determine the nature of the otto of roses, but also whether any oil of geranium or rose-wood is present in it or not.

Nitrous Acid Test.—For this I use a small glass vessel, placed upon a plate. 10 or 15 grms. of concentrated nitric acid are placed in it, and some copper turnings added. Around this, watch-glasses are placed, containing one, or *at the most*, two drops of the oils, and the whole is covered with a flat bell-glass. In a few minutes the oil of rose-wood acquires a dark-yellow color; the otto acquires nearly

the same color; whilst the oil of geranium becomes of an apple-green color, and retains it for some time.

This test will serve to distinguish the two oils when in a state of purity, and may even serve to recognise oil of geranium containing the otto, because of the yellow color which it imparts to the latter; but it is evident that it cannot serve to determine the presence of the oil of geranium in the otto of roses.

Sulphuric Acid Test.—One or two drops of the oil to be tested is put into a watch-glass; the same number of drops of very concentrated sulphuric acid are added, and the two fluids mixed with a glass rod. All the oils are rendered more or less brown by this proceeding; but—

The otto of roses retains the purity of its odor.

The oil of geranium acquires a strong and disagreeable odor, which is perfectly characteristic.

The odor of the oil of rose-wood is increased, and becomes somewhat unctuous. It is not, however, characteristic.

The commercial oil of rose-wood acquires an odor distinctly like that of cubebs.

Of these three methods, that with sulphuric acid is by far the best for distinguishing the otto of roses from the oil of geranium, and for the recognition of the second in the former. The iodine-test is also very certain, but it requires considerably more time. The nitrous acid test will serve to recognise the two oils when not mixed, or even to detect the otto of roses in the oil of geranium; but not the latter when mixed with the former.—*Ib., from Jour. de Pharm.*

ART. LXXVII.—ON THE PURIFICATION OF GUM ARABIC.

By H. PICCIOTTO, ESQ.

IT is known that gum arabic, of whatever quality, or from whatever country imported, contains, besides the pure mucilaginous substance called by some chemists, "Arabine," and which in all the different varieties is essentially the same—also more or less of all the following impurities, viz., ligneous and other insoluble fibre, sand and other earthy substances and coloring matter; moreover some varieties of gum arabic contain also a portion of that species called "Bassorine," which is insoluble in cold or hot water. These impurities necessarily interfere more or less with the good results expected in the various uses of gum Arabic, and the dark colored sorts are totally unfit for many uses. The object of the invention to be noticed in this paper is to separate all those extraneous matters from the gum, and by thus decolorizing and purifying it, render it finer, more useful, and better available for both pharmaceutical and manufacturing purposes. This object is effected by the following process, which, after a long series of experiments and researches, conducted during the period of four years, I have found to be the best on all accounts.

Having prepared a strong and purified solution of sulphurous acid gas, I introduce into it some gum, in the proportion of one of the latter to about six or eight of the former; the mixture is kept protected from the contact of the air, and when the gum is dissolved, it is found that all or most of the coloring matter has combined with the acid, and the other impurities have precipitated. Heat is now applied to the vessel, and the warm liquid is run off into a large receiver containing a quantity of carbonate o baryta in excess. Immediately a combination takes place, forming a perfectly insoluble sulphite of baryta, to which the coloring

matter remains united, carbonic acid gas is evolved, and the liquid remains nearly colorless. Then it is filtered through some very close filters, such as would not allow the passage of any particle of solid matter, and thereby a pure, limpid, and tasteless solution of gum is obtained. Sometimes the whole of the coloring matter has not been removed, and a repetition of the process is necessary to obtain a perfect whiteness. The purified filtered solution is then concentrated by evaporation at a moderate temperature, and reduced to any required degree of density, or to complete dryness. I have constantly found that none of the physical and chemical properties of the gum thus operated upon are in any way affected.

There is also another method of separating the acid from the gum in solution, equally effective, but a small portion of coloring matter remains in the gum; it is by boiling the mixture in vacuum at a temperature under 120° Fahr. The gas which is volatilized may be absorbed by charcoal placed in the receiver, or may be conducted through a pump into another receiver containing water. The solution of gum, when the process is finished, remains free from acid, if during the whole operation it has been well protected from contact with the atmospheric air.

The process described may be varied in its details, but its principles remain essentially the same; and the gum obtained, after filtration, is not found to contain the slightest particle of any of the ingredients used, and is undoubtedly *purer* and *whiter* than the finest sample of the picked white Turkey gum.

Now, I may be allowed to add a few remarks, considering the matter in a commercial point of view. At present, the white gum Arabic is a scanty product of nature; we are dependent for its supply upon the one country, (Egypt,) which alone produces the article; frequently French or Austrian merchants established at Alexandria make a mono-

poly of it, and whatever portion is imported into this country must pass through their hands. Hence its price is high, and its uses are rather restricted. Were the supply more abundant, and the cost price somewhat more moderate, the consumption would increase enormously, for there are several trades in which white gum Arabic would be used very largely, and with great advantage to the articles produced, instead of various substitutes now in use, all of which are wanting either in the brilliancy of the gum, or in some other of its useful properties. Of this I have the direct testimony of manufacturers, especially in the silk trade. The employment of the purified gum will assuredly improve the products of several British manufactures of considerable importance. In other respects also the general introduction of this article will be beneficial to English commerce. It will render us independent of the monopoly carried on by foreign merchants in Egypt; and it will give an increased value and importance to the produce of British possessions and colonies, such as East India, Australia, Cape of Good Hope, &c., by rendering the sorts of gum Arabic imported from those countries available for purposes to which they could never hitherto be applied.—*Pharm Journ.*

ART. LXXVIII.—SPURIOUS CHEMICALS.

By Jacob Bell, Editor of the Pharmaceutical Journal.

We have repeatedly had occasion to direct the attention of the readers of this Journal to the adulteration of drugs. It is now our duty to notice a system, which appears to have prevailed to a considerable extent, not of adulteration, but of the wholesale substitution of comparatively worthless compounds, for valuable and powerful medicinal

agents. Within the last few years compounds of valerianic acid with oxide of iron, with oxide of zinc, and with quina, have been introduced into medicinal practice as efficacious remedies, especially in hysteria, and other affections of the nervous and uterine system, and in fevers. A good deal of attention has been devoted by practical Chemists to the preparation of these valerianates, and several processes for making them have been published in this and other Journals. The valerianates, however, have always, and necessarily, been expensive preparations, yet the use of them has been gradually extended in consequence of the testimony borne to their great efficacy. Increased demand led to competition in the supply, which has recently resulted in the adoption, by some manufacturers, of a system of substitutions that would have speedily brought a valuable set of remedies into disrepute, had not the fraudulent practice been detected.

Citrate and tartrate of iron, flavored with a few drops of oil of valerian, has been extensively supplied for valerianate of iron; and acetate of zinc, flavored in the same way, has been substituted for valerianate of zinc; and these spurious compounds have been sold at prices which, although defying competition on the part of the genuine valerianates, have nevertheless been twenty or thirty times greater than the commercial value of the substituted articles. For valerianate of quina the disulphate of that base, with a little oil of valerian to disguise it, has been in like manner substituted.

Thus compounds have been supplied for the three medicinal valerianates, which have not contained a particle of the most important of the constituents which should have been present, namely, the valerianic acid.

Such being the nature of the frauds which have been practised, we have no doubt, upon many of our readers, we proceed to point out the means of detecting them.

1. *The true valerianates* have a sour, disagreeable, and very persistent, although not powerful smell, which is essentially different from that of oil of valerian.	1. *The spurious imitations*, being flavored with oil of valerian, smell strongly of that substance.
2. *The true valerianate of iron* is almost entirely insoluble in water; and the valerianate of quina fuses into oily globules in boiling water, and dissolves with difficulty. They are both soluble in spirit.	2. *The spurious valerianate of iron* is perfectly soluble in water, especially when aided with a little heat; it is insoluble in spirit. *The spurious valerianate of quina* is soluble in about thirty parts of boiling water, and, as the solution cools, it is deposited in acicular crystals, which have the bitter taste and other characters of disulphate of quina.
3. *The true valerianates*, when mixed with a little diluted hydrochloric acid, are decomposed, and the valerianic acid being set free, rises like oil to the surface of the liquid. To get this character it is necessary to operate upon from five to ten grains of the specimen, and to avoid the use of too much of the diluted acid, as valerianic acid is soluble in about thirty parts of water. The liberated valerianic acid has the sour, disagreeable, and very persistent smell,	3. *The spurious valerianates*, when added to water, will generally yield a thin film of oil, which floats on the surface, and is easily detected as oil of valerian. On heating the liquid this oil is driven off, without otherwise decomposing the salt, and no further indication of valerian will afterwards be obtained. On treating them with diluted hydrochloric acid there is no valerianic acid set free.

which to a slight extent is perceived in its salts, but it is readily distinguished from that of oil of valerian.

4. *The true valerianates*, when mixed with a little proof spirit, and one-fourth the volume of oil of vitriol is then carefully added, will yield valerianic ether, which is recognised by its agreeable fruity smell, somewhat resembling that of the pine-apple. This ether can hardly be distinguished in smell from butyric ether.

4. *The spurious valerianates* yield no valerianic ether; but the *spurious valerianate of zinc*, when treated as above, yields acetic ether, which is easily detected.

The foregoing tests are sufficient to distinguish the true valerianates from the spurious substitutes above mentioned, but there is reason to believe that other substitutions have been practised, although not so extensively. We have met with a specimen of so-called valerianate of iron, which is evidently not what its name indicates, and yet it contains neither citrate, tartrate, nor acetate. It is in the form of a brown powder, insoluble in water and in spirit. It smells of valerianic acid, but on being decomposed with hydrochloric or sulphuric acid, yields no appreciable quantity of the oily product. We have not had time to submit this specimen to a careful examination, but it is easily distinguished from the true valerianate of iron, by its being insoluble in spirit, while the latter dissolves freely in this menstruum, even without the application of heat. This suspected specimen is also distinguished from the genuine by its behaviour when heated in a platinum crucible.

The true valerianate, if carefully heated, fuses, gives off valerianic acid undecom-

The suspected specimen does not fuse or give off any appreciable quantity of vale-

posed, then as the heat is increased, burns with a luminous flame, and emits a very offensive odor.

rianic acid. The vapor does not readily inflame, and the odor emitted is not offensive.

The residue of oxide of iron is the same in both specimens, namely, twenty-five per cent., and the acid originally present is organic.

Where mere adulteration is practised, the detection of the fraud is much more difficult than it is in the cases to which we have hitherto alluded, the cupidity of the manufacturer having fortunately, in these cases, blinded his discretion, so that a speedy exposure of the practice was inevitable.

About three years ago, as we find from the *Journal de Pharmacie*, much of the valerianate of zinc met with in Paris, was found to have been made with butyric acid, instead of valerianic acid. The butyrate thus substituted was of a more beautiful and crystalline appearance than the true valerianate, but it did not essentially differ in character, and the detection of the fraud, by satisfactory tests, was not easily accomplished. A paper was published on the subject by Messrs. Laroque and Huraut, in which they recommend the use of a concentrated solution of acetate of copper for distinguishing valerianic from butyric acid. In the use of this test, however, it is necessary, in the first place, to eliminate the acid by adding sulphuric acid to the salt and separating the volatile acid by distillation. When butyric acid is added to the concentrated solution of acetate of copper, a blueish white precipitate is immediately formed; but on adding valerianic acid in like manner, there is no immediate appearance of precipitation or turbidity of the liquid, but on shaking it, oily drops of a greenish color, separate, partly rising to the surface and adhering to the sides of the vessel, and partly falling to the bottom. These oily globules consist of anhydrous valerianate of copper, which retains this condition sometimes for twenty minutes or more, but it ultimately becomes hydrated, and then forms a blueish green crystalline powder.

The greatest possible vigilance and care are requisite on the part of those supplying compounds, such as we are here noticing, for medicinal use. Some of these compounds have been but little studied by Chemists, and the means of distinguishing them by chemical tests is not always complete or satisfactory. If manufacturers are disposed to be dishonest, it is sometimes difficult to detect all their fraudulent practices; and a single individual may thus entail discredit upon hundreds of unconscious dupes, who become the venders or dispensers of spurious or sophisticated articles. The injury thus inflicted on medical science is of a very serious nature, for what becomes of the value of medical experience with reference to the action of remedies, if no dependence can be placed upon their identity? A physician sees an account of the great benefits which have been derived from the administration of valerianate of zinc or iron in some very troublesome complaints. He prescribes the remedy, but after a lengthened trial finds it to be unavailing, and accordingly he discards it from his Materia Medica, unless, perchance, as in the present instance, it is discovered that the remedy employed was entirely different from that prescribed, and then the dispenser and the wholesale vender are alike involved in the mortification and disgrace of having obstructed the efforts of science to relieve the sufferings of the afflicted. Is it not too often the case that the skill and learning of the physician are stultified by practices such as it has now been our painful duty to record and to reprobate?

It was but the other day that a case came within our knowledge in which a medical man, being desirous of trying the action of different anæsthetic agents, made a series of experiments with *Dutch liquid.* Having complained of the price charged for the first specimen which he obtained, further supplies were procured from a different source; but after devoting much time to the investigation of the medicinal action of the remedy, with the intention of publishing

the results, what must have been his mortification to find that the substance he had used was not Dutch liquid at all, but appeared to be a mixture of chloroform and spirit! The physical characters of chloroform and Dutch liquid are so similar that they cannot be distinguished by taste, smell, or general appearance; and the addition of a little spirit to chloroform, gives to the latter the property of burning, and reduces its specific gravity, so as to assimilate in these respects with Dutch liquid. The fraud was ultimately detected in the case alluded to by mixing some of the spurious article with water, when the spirit was separated, reducing the volume of the liquid to one-half, and this was found to be no longer combustible.

The practice of medicine is either based upon principles which have been established by the careful observation of the action of remedial agents, or it is a system of quackery and deception Yet it is obvious that all observations must be worse than worthless, and that no step can be taken in the advancement of the science of medicine as a remedial art, unless well defined agents be employed, and their identity be constantly maintained. How great, then, is the responsibility of the dispenser of medicines! How greatly is the physician dependent upon his intelligence, integrity, and skill!—and how much does it behove the public to require that those who are engaged in the administration of medicine shall be competent for the performance of their responsible duties!—*Pharm. Jour.*

ART. LXXIX.—ON SOME USEFUL PROPERTIES OF BENZOLE, AND ON A PRACTICAL MODE OF PREPARING IT.

By Charles Blachford Mansfield, B. A.

Benzole dissolves many substances with extreme readiness and in large quantities, such as many resins, mastic, camphor, wax, fatty and essential oils, caoutchouc and

gutta percha. Its volatility gives to its solution of either of the two latter substances the useful property of drying rapidly and perfectly; so that, when spread on glass or any polished surface, a film of the gum is deposited, which may readily be peeled off in the form of a tough membrane of any required degree of tenuity, and possessing all the properties of the original material. The same solutions, varnished on the skin, form admirable artificial cuticles, which have been found useful in cases of wounds and burns, and might probably be very beneficial in some skin diseases.

It dissolves gamboge in smaller quantity, and shell-lac even more sparingly; but it will mix in equal bulks with a saturated solution of lac in wood-spirit or alcohol. This property may be valuable to varnish-makers.

Copal and animè yield but slightly to the solvent power of this fluid; but its vapor, in the act of condensation, rapidly dissolves these resins; so, that, if fragments of them be suspended in the head of a vessel in which the hydrocarbon is boiling, the vapor, as it condenses on their surfaces, softens and dissolves them, and trickles back into the vessel below, in which a colorless varnish will result, more or less concentrated according to the duration of the process.

Benzole dissolves quinine, depositing it on evaporation in a crystalline form; the condensing vapor dissolves the alkaloid, especially if not recently precipitated, more readily than the boiling liquid. Cinchonine it does not dissolve, but forms with it a bulky gelatinous mass. It dissolves strychnine and morphine but sparingly.

It dissolves iodine, phosphorus and sulphur; and when boiling takes up the latter in large quantity, of which, however, the greater part crystallizes out as the fluid cools.

It has been found extremely useful in the laboratory as a solvent in researches in organic chemistry, where the high price and almost too great volatility of ether render a substitute for that agent a frequent desideratum.

It has an interest, too, as offering a cheap and ready source of many of the organic compounds of the benzoic series. Several beautiful bodies, which, from the comparative costliness of the parent materials, had only been obtained previously in very small quantities, may now be prepared in large bulk, such as nitrobenzole, nitraniline, &c. Dr. Hofman has recently used coal-tar benzole, prepared by a method which will be described below, as a convenient source of aniline, of which base he has thus produced a large quantity for some researches in which he has been engaged.

The facility with which the vapor of benzole is taken up and retained by the air at its ordinary temperatures has been mentioned above. This property has been made to do service, with great success, in an apparatus for illumination, in which a stream of air, having passed through a reservoir of the volatile hydrocarbon, is conducted through pipes to the burners, at which, being ignited like coal-gas, it yields a light of extreme brilliancy and whiteness.

The property possessed by alcohol and pyroxylic spirit of burning with an almost lightless flame, so opposite to that of the highly carbonized benzole, renders it easy, by properly adjusting a mixture of the volatile oil with either of these spirits, to obtain a fluid which shall be readily vaporized, and shall yield a flame of any required degree of whiteness. Thus a mixture of 1 part by measure of benzole and 2 parts of spirit of spec. grav. about 0.840 forms an excellent fuel for a portable gas-lamp, which supplies itself with vapor by the heat which it generates in combustion. Any excess of spirit diminishes the luminosity of the flame, while too much of the other causes a tendency to smoke. Similar mixtures may be made of benzole with acetone, or with other inflammable liquids poor in carbon.

The inhalation of benzole vapors for the production of insensibility to pain is already on record as effectual.

The promises which benzole makes of utility are sufficiently numerous to encourage a belief that it may form a special object of manufacture and of commerce. It may be procured to any extent from coal tar or from the light naphtha in which it has hitherto been "wasting its sweetness on the desert air." If absolute purity be not required, it may be prepared, with very little expense and trouble, either in the laboratory or on the large scale in vast quantities; and by a further slight outlay of time, any required degree of purity may be ensured in the product. The description of a method which has been found to yield very satisfactory results may be not devoid of interest.

The boiling-point of benzole is the same as that of alcohol of spec. grav. 0.825, (176°F.;) it is evident therefore that any of the summary processes of rectification which are practised by distillers in the manufacture of alcoholic spirits, are applicable to the separation of benzole from the ess volatile fluids of the naphtha. The method now to be described is one which extracts nearly the whole of this spirituous hydrocarbon by a very slight expenditure of time.

The light coal naphtha (of which it is best to take that which came over at the commencement of the distillation of the tar, and contains the benzole less diluted with substances having higher boiling-points) is placed in a metal retort, which is surmounted by an open vessel filled with water, and containing a worm or chamber, into which the vapor of the naphtha passes directly from the retort, and so arranged, that the less volatile fluids, which will be condensed in it, will flow back into the retort, or into a separate receiver, while the fluids more volatile than water will pass on in vapor to another condenser, which is kept as cold as possible. The water surrounding the still-head will gradually rise in temperature as the operation proceeds, and will at last boil; and when this takes place (or if the heating of the water be checked at any period of the process by

addition of cold water,) distillation will cease; for no fluid remains in the retort whose vapor is not condensable at the temperature of the head, which can never rise above 212° F. The distillate being rectified a second time in such an apparatus, keeping now the temperature of the head at or a little below 176° F., and reserving the part which comes over before the temperature in the retort has passed 194° F., a large proportion of a very volatile oil will be obtained, which, when exposed to a temperature of 4° F., will become solid to at least half its bulk. Of course, if the apparatus be double, the same result may be obtained by a single operation. A comparatively small quantity of a similar product may be obtained by receiving separately the first two or three gallons that run off from the common stills on the rectification of some hundred gallons of the light naphtha.

This produce should then be agitated with about a quarter of its bulk of oil of vitriol, or better still, with about one-tenth of strong nitric acid, and then, after separation from this agent, with oil of vitriol as above. It should then be separated from the acid and distilled (or it may be distilled from the sulphuric acid,) reserving again the portion given off below 194° F. The distillate, being tested by agitation with oil of vitriol, should remain perfectly colorless, and the acid should not now acquire a darker color than a pale straw-brown; if it acquires a deeper tint, the process should be repeated. When this result is obtained, the oil should be well washed with water, and finally with an alkaline solution.

Its further purification may now be entrusted to its congealing property. It should be exposed to a temperature of about 4° F., (which may be conveniently attained by a mixture of ice and salt;) the solid portion being then pressed and filtered, the result, after treatment with chloride of calcium, is fit for use.

The use of sulphuric acid in this process is to remove all

the basic substances present, to oxidize the brown coloring matter, (of which however but a small quantity accompanies the most volatile part of the light coal naphtha,) and to remove such of the neutral oils as form compounds with oil of vitriol. Among these latter, an alliaceous oil, more volatile than benzole, is withdrawn, while the latter entirely resists the action of this acid even on being boiled with it. The nitric acid assists in the removal of the oxidable substances, and by forming a small quantity of fragrant nitrobenzole, (which is left behind as residue on the distillation of the fluid,) improves the odor of the product.—*Chem. Gaz. from the Quarterly Journ. of the Chem. Soc.*

ART. LXXX.—RESEARCHES ON THE COMPOSITION OF HONEY.

By M. Soubeiran.

The honey of bees contain two different sugars, the one solid, the other liquid. The former has been considered as identical with the granular sugar, which is deposited in the course of time from the syrup of the grape, or from the syrup of cane-sugar altered by acids. With respect to the liquid part of honey, it has been little examined. M. Biot, however, has ascertained that it consists of a sugar which turns the rays of polarized light to the left.

The experiments contained in this memoir show that honey contains three distinct sugars,—first, the granular sugar, or glucose of chemists; another sugar, with right-handed rotation, and which is alterable by acid; and lastly, a sugar, the rotatory power of which is exerted towards the left, but with an energy almost double that of the sugar acted upon by acids.

I found the sugar possessing a right-handed rotation, and which is capable of being altered, in ordinary honey; but

it is especially abundant in the liquid honey contained in the cells of the comb. The proportion is so great, that a solution of this honey which had a deviation of +0.96 ʒ acquired, after the action of acids, a rotation in the opposite direction equal to —13.78 ʒ. I have named *liquid sugar of honey*, the liquid portion of which can be extracted from honey by pressure. My experiments were made upon a sugar which had been extracted in 1841, and which has kept to this day without experiencing the least change, or exhibiting any sign of crystallization. This circumstance alone would suffice to distinguish it from the sugar altered by acids, which would soon have solidified into a mass of granular sugar. The liquid sugar of honey presents, however, a great number of characters which belong to cane-sugar altered by acids. Like it, it is uncrystallizable, and may be reduced to the state of barley-sugar, transparent and solid, but which melts with great facility; again, it resembles it in being very sensitive to the action of alkalies, and is readily destroyed by their influence. The two sugars have the same chemical composition, and enter into combination with the alkalies. Thus the totality of these characters would tend to confound these sugars; but they are distinguished almost immediately by the absolute impossibility of converting the liquid sugar of honey into granular sugar, and by a very great difference in the rotatory power, which is nearly double in the liquid sugar of honey.

The absolute rotatory power of this liquid sugar at the temperature of 55°.4 F. for the red ray and for a length of 100 millimetres, was found equal to —33.103 ʒ, whilst that of sugar changed by acids was found under the same circumstances merely =18°.933 ʒ. The liquid sugar of honey retains the rotatory power to the left, even after it has been brought to the solid state; it is one of a very small number of bodies in which this peculiarity has been observed.

The third sugar which forms part of the honey is distin-

guished from the granular sugar from its being altered by acids, and from the liquid sugar in possessing a rotation to the right. Irs amount, which is pretty considerable in the liquid honey of the combs, diminishes in time, and may even disappear entirely in solidified honey.

I have limited myself at present to the establishing the facts as they result from observation; it is my intention to submit the honey of the combs to careful investigation, and also to inquire into the history of the curious transformation of the liquid into solid honey. Some experiments which are not yet completed, promise to throw considerable light upon these phenomena, and some facts of the same class which have already been published by M. Dubrunfaut.—*Chem. Gaz., from Comptes Rendus.*

ART. LXXXI.—ON THE COLORING MATTERS OF DUTCH OR CAKE LITMUS.

By Jonathan Pereira, M. D., F. R. S.

The object of the present notice is to draw attention to the coloring matters employed by the Dutch to color *cake litmus;* which, as is well known, is wholly imported from Holland.

The essential coloring matter of this pigment is obtained from lichens. In England two dyes or pigments only, both of a purple color, are procured from these plants: they are *orchil* and *cudbear;* the former a liquid or pulp, the latter a powder. The substances which are essential to their production are certain lichens, water, ammonia, and oxygen (of the air.) By the united agency of the three latter substances on certain colorific principles contained in the lichens, one or more colored products are obtained, which, though probably not identical, pass under the

general name of *orceine*. In order to obtain the well known blue color which is essential to the production of cake litmus, it is necessary to use, in addition to the ingredients above mentioned, a fixed alkali, namely, either potash or soda. Without this the product would be purple, in other words, it would be orchil or cudbear. The Dutch manufacturers use, I suspect, potash ; for if a cake of litmus be ignited in the outer cone of the flame of a candle, the flame acquires a whitish violet tint, indicative of the presence of this alkali. This suspicion is confirmed by the statement of Ferber, who saw litmus in process of manufacture at Amsterdam, and who tells us that besides the lichen, there were employed urine, lime-water, slacked lime and potashes. The urine was used to yield, by decomposition, carbonate of ammonia ; and the carbonate of potash, and probably was otherwise useful in the process.

In order to give body to the blue coloring matter thus produced, and which I shall provisionally call *lichen blue*, the Dutch employ some one or more earthy substances, to enable them to form the litmus into cakes. Ferber does not appear to have been aware of this ; for he says that the lichen has been sufficiently macerated, and the blue color developed, the mixture is ground in a mill, which, he adds, he was not allowed to inspect. I presume that the Dutch manufacturer used something, in this part of the process, which he was anxious to keep secret.

The presence of the mineral or earthy constituent of litmus is readily shown by exposing some cakes of litmus, in a platinum or glass capsule, to the heat of a spirit lamp. The coloring matter is volatilized and destroyed, leaving the fixed constituents, presenting the volume and shape of the original cakes. Into the composition of the ashes of litmus it is not the object of this paper to enter.

In order to give these cakes a strong blue color, the Dutch manufacturer introduces into the paste another blue coloring matter, namely, *indigo*. Hitherto no one has alluded

to the presence of indigo in cake litmus; yet the facts I am about to lay before the Society leaves no doubt, in my mind, of its existence in all the specimens of Dutch litmus which I have hitherto examined. Ferber, of course, makes no mention of it; and I have no doubt that one reason why he was not permitted to inspect the mill was, that he might not discover the fact of the introduction, not merely of the earthy matter to give body to the cake, but also of indigo to give color.

The existence of indigo in cake litmus is proved by the following facts:

1st. The *color* of the cake is indigo-blue.

2dly. Their *odor*, when fresh, is essentially that of indigo. There is also a slight violet smell, which is developed by the lichens when undergoing fermentation, and which has led some writers into the error of supposing that Florentine orris is used in the manufacture of litmus.

3dly. If the cakes be rubbed with the nail they assume the well known coppery lustre which characterizes indigo; but which of course is much less intense in the litmus cake than in a mass of pure indigo.

4thly. If the cakes be heated by a spirit lamp, in a platinum capsule or watch glass, a vapor is evolved, which is known to be that of indigo by the following characters—

α. Its peculiar and very characteristic odor.

β. Its reddish-violet color.

γ. Its condensation in the form of beautiful coppery-purple crystals, which, when rubbed with oil of vitriol, form the blue liquid known as *sulphate of indigo*, and which is decolorized by hypochlorite of lime. The crystals, when examined by the microscope, present, when viewed as opaque objects, a beautiful coppery brilliancy; and when viewed as transparent objects, by transmitted light; some of them are of a deep blue color.

5thly. Litmus cakes, when deprived of their lichen-blue by digestion in distilled water or spirit, still retain a blue

color, showing that they contain a blue coloring matter insoluble both in water and spirit.

If these facts are considered sufficient to establish the existence of indigo in litmus cakes, it follows that the analyses of litmus hitherto published cannot be relied on, and in fact are of little value, since none of them make any mention of indigo as a constituent of litmus.

My examination of litmus cakes leads me to infer that they consist essentially of five parts:

1. *Lichen-blue.*
2. *Indigo-blue.*
3. Organic remains (portions of the lichenous tissues.)
4. An ammoniacal salt, separable from the cakes, by sublimation, in the form of carbonate of ammonia.
5. Mineral or earthy matter (chalk, &c.)

The lichen-blue is the peculiar coloring matter which renders litmus valuable as a test. It is soluble in water and in spirit, is reddened by acids, but does not become green by the addition of alkalies.—*Pharm. Journn.*

ART. LXXXII.—ON THE CINNAMON REGION OF EASTERN AFRICA.

By Mr. W. D. Cooley.

The eastern angle of Africa was at a very early period named, from its exchangeable produce, Aromata; and from the Straits of Bâb el Mandel to Cape Gardafui, we then meet in succession the *Regio Myrrhifera, R. Libanotophora, and R. Cinnamonifera.* In the classic ages of Greece and Rome, the belief was general that most spices were derived from Arabia Felix or Yemen, the country of the Sabæans, in a later age called Hymiarites, or Homerites. But a care-

ful examination of ancient authors, proves that the Sabæans were but the *carriers*, not the producers, of these aromatics. Herodotus includes under the general term Arabia the whole territory east of the Nile, and in giving his semi-fabulous account of the mode of collecting cinnamon, had included not the peninsula of Arabia, but the African part east of the Nile. Besides Herodotus, a long list of ancient authors may be quoted as supporting this view of the subject, viz: Eratosthenes, Strabo, Pliny, Ptolemy, Arrian, (the author of the Periplus) Philostorgius, Cosmas, Indicopleustes,—all of whom agree in placing the region of Cinnamon at the eastern extremity of Africa. Theophrastus (the disciple of Aristotle,) Galen, and Dioscorides, all state that the best cinnamon was derived from Mosyllum. Arabia Felix owed its great prosperity to its carrying trade; and in Ezekiel we are informed that the Sabæans traded in Tyre "with the chief of all spices." In the inscription of Adulis (A. D. 330) copied by Cosmas, mention is made of "the tribes of the Rausi, who occupy the immense plains adjacent to the region of Frankincense;" and we have no difficulty in recognising in these Rausi the present Arusi, occupying the hills around the sources of the Webbe, and who are described as one of the great tribes of the Gâla. The commerce of this country underwent, at length, the most violent changes, and the original population has been driven back by the influx of Arabs and Mohammedan tribes, (the Somâli.) In an Egyptian papyrus dating as far back as the reign of Menephthah the Third, (B. C. 1100,) Dr. E. Hincks has discovered a mandate respecting the purchase of aromatics from the land of Arus or Arusa; and in coupling the local name and the merchandize, we can but conclude that Egypt three thousand years ago obtained a supply of aromatic drugs from the Analitic Gulf. This fact throws perhaps some light on the historical tradition "that Sesostris led an expedition to, and left graven monuments in, that quarter." That a country named at so early a

period from its valuable produce, should lose so important a trade, may be attributed to the following causes: 1. The fall of Egyptian civilization and of Paganism, on the customs of which depended the consumption of the aromatics. 2. The revolutions in the countries around the Red Sea accompanying the spread of Mohammedanism,—with the impeded intercourse between the Christian and Mohammedan worlds. 3. Discovery of the route to India round the Cape of Good Hope, and the consequent shifting of the channels of commerce. 4. The wanton destruction of the towns on the shores of the Red Sea by the Portuguese, and the implacable hatred therefore conceived by the natives towards Christians. The ancients and the Arabs appear to have known nothing concerning the cinnamon of Ceylon, though the latter speak of that of Malabar. Arrian, in his Periplus, mentions Malao and Mundi (perhaps the sites of Zeylah and Berbera) and Mosyllum as the most important places on the coast. "From this neighborhood is exported a large quantity of cassia, in consequence of which, this port requires ships of a larger size." Further on he mentions Acannæ (Buraidi, E. of Ras Ululah;) then, doubling Cape Aromata, he names Tabæ (near the Wadi Tohum) "where the country produces much spice, &c." Arrian afterwards names Opone (Hafoon) "which ports was visited by the ships from India, bringing the cane honey, called Sacchari." Ancient authors add, however, that cinnamon and cassia came from the interior. Hence, Ptolemy filled up the blanks in his maps between the frequented coasts and the sources of the Nile, which he adopted from Marinus Tyrius, by placing the cinnamon country above those sources, while he fixes the Region of Myrrh, which is, in truth, the Wadi Nogal, at the sources of the Astapus. If, therefore, the design be entertained of exploring this in many respects highly interesting country, there can be no doubt as to the limits within which may be confined the labors of the expedition, the chief object of which is to become acquainted

with the aromatic productions of the land. All these will be found in the angle cut off by the Wadi Nogal, or in the limestone mountains of the Singheli and Mijjerthein tribes, between Ras Gulwaini and Hafoon. South of this region begins the Khazain (the Azenia of the ancients,)—that is, the sandstone mountains and the desert. Within the limits here pointed out, on the south-western face of the mountains, at a moderate elevation, will probably be found the Laurineæ sought for, together with a great variety of aromata (spicy drugs,) enodia (perfumes,) and thymiamata (kinds of incense,) many of which are named, but not described by the ancients.—*Pharm. Journ., from Athenæum.*

ART. LXXXIV.—ACTION OF WATER ON LEADEN SERVICE PIPES. By E. N. HORSFORD, Professor of Chemistry in the University of Cambridge, U. S.

THE following extracts are taken from a very important investigation published in the Proceedings of the American Academy of Arts and Sciences, for a copy of which we are indebted to the kindness of the author. The researches were undertaken at the request of the Board of Consulting Physicians of the city of Boston, and extend to fifty pages of closely printed letter-press. We give the author's conclusions, which have more than a local interest, and the method which he proposes for determining small quantities of lead, which promises to be of considerable service in such investigations :—

The waters used by man in the various forms of beverage and for culinary purposes are of two classes, viz.

1. *Open waters, derived from rain-falls and surface-drainings, like ponds, lakes, rivers and some springs ; and*

2. *Waters concealed from sunlight, and supplied by lixiviation through soils or rock, or both, of greater or less depth, such as wells and certain springs.**

They differ, (*a.*) in temperature; well-water, through a large part of the year, is colder than lake, pond or river water; (*b.*) in the percentage of gases in solution; recently drawn well-water, in summer particularly, parts with a quantity of air upon exposure to the surface of the temperature. In winter these relationships must to some extent be inverted, in high latitudes for a longer, and in lower latitudes for a shorter period.

(*c.*) They differ in the per-centage of inorganic matter in solution; well-waters contain more; (*d.*) in the relative proportions of salts in solution; well waters contain more nitrates and chlorides; and (*e.*) in the per-centage of organic matter; well waters contain less.

Relations of Lead to Air and Water.—(*a.*) Lead is not oxidated in dry air, or (*b.*) in pure water deprived of air. (*c.*) It is oxidated in water, other things being equal, in general proportion to the amount of uncombined oxygen in solution. (*d.*) When present in sufficient quantity, nitrates in neutral waters are to some extent reduced by lead. (*e.*) Both nitrates and chlorides promote the solution of some coats formed on lead.

(*f.*) Organic matter influences the action of water upon lead. If insoluble, it impairs the action by facilitating the escape of air; if soluble, by consuming the oxygen in solution, and by reducing the nitrates when present. The green plants, so called, the animalcula which evolve oxygen, are abundant in open waters in warm weather only, and of course when the capacity of water to retain air in solution is lowest; so that, although oxygen is produced in open waters by these microscopic organisms, it does not increase the vigor of their action upon lead.

* Rain-water is to some extent employed as a beverage. It is more nearly allied to waters derived from surface-drainage.

(*g.*) Hydrated peroxide of iron (iron rust) in water is not reduced by lead. Hence may be inferred the freedom from corrosion of leaden pipes connected with iron mains, so far as the reduction of the pulverulent peroxide of iron may influence it.

(*h.*) Alkaline chlorides in natural waters deprived of air do not corrode lead. (*i.*) Salts generally impair the action of waters upon lead, by lessening their solvent power for air, and by lessening their solvent power for other salts.

A coat of greater or less permeability forms in all natural waters to which lead is exposed. The first coat *(j.)* is a simple suboxide absolutely insoluble in water and solutions of salts generally. This becomes converted in some waters into a higher oxide, and this higher oxide, uniting with water and carbonic acid, forms a coat (*k.*) soluble in from 7000 to 10,000 times its weight of pure water. The above oxide unites with sulphuric and other acids, which sometimes enter into the constitution of the coat (*k.*); uniting with organic matter and iron rust, it forms another coat (*l.*) which is in the highest degree protective. The perfection of this coat, and of the first above mentioned, may be inferred from the small quantity of lead found in Croton water (New York) after an exposure in pipes of from twelve to thirty-six hours, and from the absence of an appreciable quantity in Fairmount water (Philadelphia) after an exposure of thirty six hours, when concentated to $\frac{1}{200}$ths of its bulk.

Method of determining small Quantities of Lead.—The recognition and quantitative determination of very minute quantities are not always without difficulty; where many and rapid determinations are required, the processes of gathering upon a filter, washing, drying, igniting and weighing consume far too much time, and are sometimes less accurate than other and more indirect methods.

That which I have employed is based upon the mode of analysing silver coin proposed by Gay-Lussac, and general-

ly adopted at mints. The same general method has been extended by Gay-Lussac to ascertain the strength of alkalies and bleaching powder. It is employed with protosulphate of iron and subchloride of mercury for the latter purpose. It is the method of graduated solutions.

A gramme of lead in the form of the acetate (common sugar of lead,) which contains 3 atoms of water, is dissolved in 100 grms. or parts of distilled water. This constitutes solution No. 1.

10 parts of this solution are diluted with 90 parts of water to make solution No. 2.

10 parts of solution No. 2, diluted with 90 parts of water, make solution No. 3.

In the same manner solutions No. 4, No. 5 and No. 6 are prepared.

10 parts of each solution are placed in corresponding test-tubes (about six inches long, five-eighths of an inch wide, and closed at one end,) and hydrosulphuric acid transmitted through them, till the liquid, first blackened by the formation of sulphuret of lead, becomes clear.

Test-tube No. 1 contains one-tenth of a gramme of lead in the form of sulphuret—a black powder at the bottom.

Test-tube No. 2 contains one-hundredth of a gramme.

No. 3, one-thousandth.

No. 4, one ten-thousandth.

No. 5, one hundred-thousandth.

No. 6 yielded no precipitate without concentration.

Each succeeding precipitate in the series, setting aside a slight allowance to be made on account of solubility, was one-tenth as voluminous as the one above.

Having prepared this scale of quantities, it is required to determine the amount of lead in a given diluted solution. An experiment is made to ascertain if the quantity be large enough to give an immediate precipitate with sulphuret of ammonium. This being decided in the negative, 50 cubic centimetres or grammes of water (corresponding with 50

parts of the scale of solutions) are carefully evaporated to dryness and ignited in a small porcelain capsule, to expel any organic matter that may have been present, moistened with nitric acid, and then warmed, with the addition of acetic acid and water, till the volume becomes 10 cub. centim. A drop of acetate of potash is then added, and then hydrosulphuric acid gas transmitted through the solution.

A precipitate results, or it does not. If it does, to know its value or the amount of lead it contains, the scale is resorted to. Though it might rarely be possible to identify it with either one of two precipitates in the scale, there could be no difficulty in deciding between which two it should fall, or nearest to which one of two it should be placed.

If 50 cub. centim. thus treated yielded no precipitate, 100 cub. centim. were evaporated to dryness, and the residue similarly treated. If this failed, 500 cub. centim. were taken, and in some instances more, and the same course pursued.

It was natural to suppose that the presence of foreign bodies, such as occur in natural waters, might embarrass the precipitation. This led to the preparation of a series of graduated solutions of lead, with all the common salts occurring in waters, from the reagents in my laboratory. They are similarly treated with acetate of potash, free acetic acid, and a stream of hydrosulphuric acid; and though it was possible to see differences in the amounts of the precipitates, they fell very greatly within the differences between the successive members of the graduated series. *Chem. Gaz.*

ART. LXXXV.—ON A NEW ALKALOID CONTAINED IN THE SEED OF AGROSTEMMA GITHAGO.

By H. Schulze.

This alkaloid, which the author has called *agrostemmine*, is contained abundantly in the outer coat of the seed. The entire seeds were exhausted with weak alcohol, to which some acetic acid had been added, the concentrated liquid mixed with magnesia, and the dried precipitate treated with alcohol. On evaporating this solution, the alkaloid separated in crystals, which, after frequent recrystallization formed yellowish-white laminæ. They fuse at a slightly elevated temperature, dissolve with difficulty in water, readily in alcohol, communicating to it an alkaline reaction. It furnishes, by neutralization with dilute acids, crystalline salts. The platinum double salt was obtained as a reddish-brown crystalline precipitate, by mixing an alcoholic solution of agrostemmine with chloride of platinum. The chloride of agrostemmine and gold separates slowly in yellow granular crystals from an alcoholic solution.

The sulphate is obtained in beautiful crystals, which are readily soluble in hot water, still more so in alcohol. The phosphate forms a bulky precipitate.

On boiling with solution of caustic potash, it is decomposed with evolution of ammonia, differing in this respect from all the other natural alkaloids. The solution then furnishes a white precipitate with muriatic acid. Concentrated sulphuric acid colors it first red, and then blackens it. —*Archiv de Pharm.*

ART. LXXXVI.—ON THE RELATIONS EXISTING BETWEEN SUGAR AND TARTARIC ACID.

By M. Bouchardat.

Sugar and tartaric acid possess characters in common which are well worthy the attention of Chemists. M. Bouchardat thus describes them:

When sugar or tartaric acid is thrown on to incandescent coals, in either case empyreumatic products are given off, which are distinguished by the odor of caramel.

When pounded in a mortar, in the dark, both crystallized sugar and tartaric acid emit a manifest electric light. The other organic acid, and citric acid in particular, do not possess this property. It therefore follows that we may distinguish tartaric from citric acid, and ascertain whether the latter has been adulterated with the former.

Sugars in solution act upon polarised light, possessing in a high degree the power of rotating the plane of vibration. Cane-sugar, which has been changed by acids under the influence of heat, possesses this power, and the direction of the rotation may even be altered by the action of the acid. Tartaric acid, either free or combined with water, with bases, or with boracic acid, presents remarkable instances of variations of rotatory power.

A concentrated solution of citric acid being void of rotatory power, nevertheless acquires that property if mixed with tartaric acid. It therefore follows that we may also, by this means, detect the adulteration of citric with tartaric acid.

In addition to the characters possessed in common by sugar and tartaric acid, very frequently the decomposition of these two substances gives rise to similar products.—*Pharm. Jour., from Journal de Pharmacie.*

ART. LXXXVII.—ON THE PREPARATION OF SUCCINIC ACID FROM MALATE OF LIME.

By Prof. Liebig.

The highly important and beautiful observations of Dessaignes on this subject induced me to examine whether the malate of lime might not be converted more rapidly and perfectly into succinate of lime by an ordinary process of fermentation than by the plan proposed by that chemist, and whether an advantageous method of manufacturing succinic acid on a large scale might not be founded upon it.

These experiments have been crowned with complete success. The decomposition of the malate of lime can be effected far more easily and rapidly than the conversion of the lactate of lime into butyrate, by employing the same ferment as is used in the butyric acid fermentation. The malic acid is decomposed under these circumstances into succinic, acetic and carbonic acids.

When to a mixture of 1 part malate of lime and 5 to 6 parts of water the tenth part of the volume of the water of ordinary yeast is added, a pretty lively evolution of gas soon ensues when the mixture is placed in a warm situation. The gas which is disengaged is pure carbonic acid, and is absorbed without the least residue by potash.

After three days an essential change in the form of the malate of lime is perceptible; it becomes granular, heavy and crystalline, and in the course of the fermentation these granules increase constantly in size. When the fermentation is complete, *i. e.* when the evolution of gas has ceased, the mixture loses on agitation its muddy condition; the granules appear under the microscope to be composed of stellate groups of transparent needles, which quickly subside like heavy sand when stirred. These crystals consist of a double salt of succinate of lime with carbonate of lime. The supernatant liquid contains acetate of lime.

The formation of succinic acid is effected with equal ease and rapidity by putrefying fibrine or putrefying cheese; the latter is especially adapted for this purpose; the following proportions prove to be most advantageous:—3 lbs. of crude malate of lime, as it is obtained from the expressed juice of the berries of the mountain ash,* after being twice or thrice washed with water, is mixed with 10 lbs. of water at 104° F. in an earthen pan, and 4 oz. of putrid cheese, which has been previously rubbed into an emulsion with water, is added to the mixture. When kept between 86° and 104°, a disengagement of gas very soon begins, which continues from five to six days (longer at a low temperature.) In another experiment with 15 lbs. of malate of lime, the fermentation was over in four days.

When every sign of fermentation has disappeared, the granular crystalline deposit is collected upon a strainer, washed several times with cold water, and the succinic acid then separated by means of sulphuric acid. For this purpose, the crude succinate (and carbonate) of lime is mixed with dilute sulphuric acid until no further effervescence is perceptible, and the quantity of sulphuric acid consumed is noted down. Upon this an amount of dilute sulphuric acid equal to that consumed is added to the paste, and the entire mixture heated to boiling, and kept at this temperature until the granular consistence has entirely disappeared. The liquid is separated from the gypsum formed by the filtration through a linen bag, the gypsum washed, and the acid liquid concentrated by evaporation; it contains in solution a mixture of bisuccinate of lime with succinic acid. When it has been so far evaporated that a crystalline pellicle begins to form on the surface, concentrated sulphuric acid is added to it in small portions until no further preci-

* In this country the malate of lime might probably be obtained from culinary rhubarb according to the process described by Mr. Everitt, Chem. Gaz., vol. i., p. 248, [or from sumac berries in the U. States.—Ed.]

pitate of gypsum is formed. In general the liquid congeals to a pasty mass by the newly formed gypsum; it is diluted with water, and the succinic acid separated by washing. On evaporating the liquid and cooling, a crop of brownish-colored crystals of succinic acid separates, which contains minute traces of gypsum. This colored acid is dissolved in boiling water, filtered, set aside to cool, the crystals thrown upon a funnel, and the mother-liquor removed with cold water. The acid obtained by this second crystallization is again dissolved in water, boiled with a little animal charcoal, and the transparent solution crystallized. The crystals are of a dazzling white; they can easily be freed from a trace of gypsum by solution in alcohol or sublimation. 3 lbs. of dry malate of lime furnished from 15 to 16 oz. of dazzling white succinic acid. In my experiments not a trace of malic acid was found in the mother-liquor from the succinic acid; so that in this remarkable process of fermentation the whole of the malic acid is completely decomposed. The process with putrid cheese differs from that with yeast, in hydrogen gas being disengaged along with the carbonic acid towards the end of the operation.

Science is indebted to M. Dessaignes for this beautiful discovery, and it is to be hoped that fermentation will come more into use as one of the most powerful agents for chemical decompositions. It is easy to prepare from malate of lime any amount of this interesting but hitherto expensive acid; and a number of useful applications may possibly follow from this discovery.—*Chem. Gaz. from* Liebig's *Ann.*

ART. LXXXVIII.—RESEARCHES ON EMULSINE.

By B. W. Bull.

The emulsine employed in the following experiments was prepared from sweet almonds, from which the oil had been removed by pressure. They are formed into an emul-

sion with three times their weight of water, and the whole exposed for twelve hours to a temperature between 68° and 78°. In this interval a yellowish-white coagulum separates on the surface; the liquid is of a light yellow color; and furnishes a precipitate with acetic acid, which however no longer appeared after it had been kept for two or three days. Alcohol furnishes a precipitate which entirely redissolves on the addition of water. As soon as the coagulum had separated, the liquid was filtered, and also the precipitate produced by the acetic acid. The emulsine was precipitated from the filtered solution with alcohol of 0·848 spec. grav., of which it acquired twice its volume.

The emulsine thus obtained, well washed with alcohol and dried in the air, is a transparent, gummy, readily-friable substance of a dark or reddish-brown color, without odor and without any particular taste. It dissolves only after long standing or on trituration with water, leaving an insoluble residue, which contains, besides some phosphate of magnesia and some phosphate of lime, a considerable amount of organic substance. This insoluble residue, even when completely washed with distilled water so as to remove all soluble matter, still furnishes the characteristic reaction of emulsine with amygdaline. Four analyses of this residue furnished the following results :—

	I.	II.	III.	IV.
Organic substance	56	69·45	59·48	80·27
Ash	44	30·55	40·52	10·73

The solution of this emulsine is opalescent, and very readily converts amydgaline to oil of bitter almonds and prussic acid.

Emulsine which has been dried *in vacuo* over sulphuric acid has nearly the appearance above described; in general it is not so dark, sometimes having a brownish yellow tint, and in other cases a brownish-red. When dried in the air, in proportion as the alcohol escapes it absorbs moisture with great avidity.

The precipitate of emulsine acquires a totally different

appearance when it is first washed with strong spirit, and then with absolute alcohol, until every trace of water has been removed, and then dried *in vacuo* under sulphuric acid. It then forms a milk-white, very friable mass, which is perfectly opake, without lustre, and far more soluble than the emulsine prepared according to other methods. About 6 grms. of emulsine was obtained from a pound of almonds after the oil had been expressed. If larger quantities are employed, the time required for washing and filtration is considerably lengthened, and a more or less colored preparation is obtained. If it is dried over sulphuric acid in a recipient filled with air, it becomes transparent, gummy and colored by the absorption of water.

Certain substances prevent the reaction of emulsine with amygdaline, for instance alcohol and acetic acid. The property of being precipitated by alcohol is not peculiar to the emulsine, but is owing to the phosphates which it contains in solution, and with which it so intimately combined that it was impossible to separate the emulsine without destroying it.

Emulsine has an acid reaction. After it has been washed with alcohol until what passes through is perfectly neutral, the moist emulsine strongly reddens blue litmus-paper. Emulsine which has been dried and again dissolved is likewise acid, and this acid property it owes to the presence of phosphates in the almond emulsion. An emulsion f almonds, which was neutralized with lime-water and filtered, distinctly furnished the reaction with amygdaline; but the filtered liquid was not precipitated by alcohol, and it contained not a trace of phosphoric acid. Ammonia acts in the same manner. The liquid, it is true, becomes turbid on the addition of alcohol; but the turbidness cannot be removed by filtration, and is deposited only after some days as a scarcely perceptible precipitate.

When the neutralized liquid is set aside at the ordinary temperature, it begins in the course of a few days to be de-

composed, with a disagreeable odor; a precipitate separates, but it no longer becomes acid.

Emulsine does not coagulate, but at a boiling heat it behaves in a very peculiar manner; between 95° and 96° its solution becomes turbid, at 113° it becomes opake and milky, and between 185° and 212° it gradually deposits a snow-white granular precipitate. If the liquid is boiled for a few minutes, the filtered solution, each time that it is heated to boiling, becomes quite opake, and deposits a copious flocculent precipitate; on cooling, this entirely redissolves. This experiment can be repeated several times with the same result. The granular precipitate first formed amounts to about 10 per cent. of the emulsine employed; it is perfectly white, can be easily reduced into a very fine powder, and leaves on incineration a neutral ash, which in one experiment amounted to 48·74, and in a second to 59·11 per cent., and consisted of phosphate of magnesia with some phosphate of lime. The organic substance combined with it contained nitrogen, but no sulphur that could be detected in it by potash and a salt of lead.

The liquid filtered from the precipitate contains two products of decomposition of emulsine, one of which, forming about a fourth of the quantity originally employed, is not precipitated by alcohol, whilst the other, constituting about 30 per cent., separates upon the addition of strong alcohol in the form of a white granular precipitate. Washed with alcohol and ether and dried, this precipitate forms a white, opake, tenacious mass, which is difficult to powder, and contains a large, although variable, amount of the above salts of phosphoric acid. Several experiments furnished from 18 to 35 per cent. of ash. The analyses gave the following results, according to which the substance differs essentially from emulsine :—

Carbon	43·17	40·11	42·48
Hydrogen	6·85	6·73	7·92
Nitrogen	8·62	8·34	8·48
Oxygen and sulphur	41·36	41·83	42.02

Acetate of lead separates this substance into two others, one of which contains sulphur, the other none. To the aqueous solution of the fresh precipitate obtained by alcohol, acetate of lead was added as long as a precipitate resulted; this was suspended in water, decomposed by sulphuretted hydrogen gas, and the excess of sulphuretted hydrogen expelled at a gentle heat. The filtered liquid had a strong acid reaction, which arose partly from phosphoric acid, partly from an organic substance. Upon concentration it formed a syrupy mass, which was decomposed by potash, with evolution of ammonia, and with a salt of lead it showed the presence of sulphur.

The liquid filtered from the precipitate obtained by acetate of lead, furnished, after removing the lead and the acetic acid, on evaporation, a neutral gummy mass, readily soluble in water, and which yielded a jelly with a solution of caustic potash. It contained nitrogen, but no sulphur.

Unboiled emulsine is so completely precipitated from its solution by neutral acetate of lead, that the filtered liquid no longer furnishes oil of bitter almonds with amygdaline, whilst the lead precipitate retains this reaction.

A solution of emulsine begins, in the course of four or five days, by exposure to the air at the ordinary temperature, to be decomposed with evolution of gas; it becomes turbid; gives with neutral acetate of lead, but not with acetic acid, a copious precipitate, and still retains for some time the reaction with amygdaline.

A solution of emulsine, which has been freed from the phosphates by neutralization with lime-water, yields with neutral acetate of lead a thick precipitate. This was decomposed with sulphuretted hydrogen. After filtration and removal of the excess of sulphuretted hydrogen at a gentle heat, an acid liquid was obtained, which left on evaporation an acid gummy mass containing nitrogen. It was insoluble in alcohol and ether; it formed with baryta and silver insoluble, with magnesia soluble salts.

The liquid filtered from the precipitate with acetate of lead

left on evaporation, after removing the sulphuretted hydrogen and acetic acid, a gummy nitrogenous mass.

On distilling the alcohol which had served to precipitate the emulsine, the liquid acquired a dark colour, and left on concentration an acid mass, the acid in which proved to be lactic acid.

The precipitate obtained with acetic acid previous to the precipitation of emulsine by alcohol, formed, after it had been freed from fat by exhaustion with alcohol and ether, a reddish fine light powder, soluble in alkalies; but on warming the solution, it is decomposed, with disengagement of ammonia. This substance is not precipitated from its alkaline solution by alcohol; it is moreover soluble in weak, and only partially soluble in concentrated acetic acid. It contains nitrogen and sulphur, and burns with a smoky flame, leaving a small quantity of neutral ash. It dissolves in strong muriatic acid into a beautiful red liquid, which color changes into a dark purple in the course of one or two days. It gelatinizes in sulphuric acid, and changes, with evolution of sulphurous acid, from red into black. On analysis it was found to contain 51.02 per cent. carbon, 6.87 hydrogen, 15.80 nitrogen, 25.74 oxygen, and 0.57 sulphur. The relation of nitrogen to carbon is as 1 to $7\frac{1}{2}$.

In the maceration of recently-pounded almonds with ordinary alcohol, grape-sugar was extracted, which was obtained by means of water from the residue remaining on evaporating the alcohol.

When an emulsion of almonds, prepared as above directed, is allowed to ferment for some days at about 86°, an oily coagulum separates, and the subjacent liquid becomes more and more sour. This acidification has great resemblance to the becoming sour of ordinary milk. The conversion of the sugar into lactic acid, and the union of this acid with the bases which held the caseous substance in solution, explains the separation of this coagulum and the absence of any precipitate with acetic acid, as soon as a sufficient quantity of lactic acid has

been formed to separate the caseous substance from its combination with the alkalies.

Emulsine loses the property of decomposing amygdaline into oil of bitter almonds and prussic acid when its solution has been boiled, which is not the case when it is exposed in the dry state to a temperature of 212°.

It was found very difficult to obtain the substance in a pure state fit for analysis, on which account the results do not agree very accurately with one another; however, so much is evident from the analyses, that the emulsine precipitated by alcohol has a definite composition. The materials used for the following six analyses were prepared at different times. I. to IV. were dried for several days at 212°. For No. V. a fresh emulsion of almonds was first mixed with ether to dissolve the oil, and then set aside for two or three days in a closely-stopped vessel until the mixture had separated into two parts; the upper stratum was a thick, opake, somewhat gelatinous mass, and consisted of a solution of the oil in ether; the subjacent aqueous liquid was filtered, and immediately precipitated by alcohol. The emulsine prepared in this manner does not differ essentially in its composition from the others, as will be seen by the following numbers. VI. was prepared like I. to IV., but dried at 266°:—

	I.	II.	III.	IV.	V.	
Carbon,	43.59	43.74	42.75	42.09	43.08	43.15
Hydrogen,	6.96	7.33	7.37	7.34	6.81	7.39
Nitrogen,	11.64	11.40	11.52	11.52	11.52	11.52
Sulphur,	1.25	37.53	38.36	39.05	38.59	37.94
Oxygen,	36.56					

The formula $C^9H^9NO^6$ would correspond to these numbers; and if the amount of sulphur were likewise considered essential, it would be $10(C^9H^9NO^6)+S$.—*Ibid. from Liebig's Annalen.*

ART. LXXXIX.—ON THE PLANTS FROM WHICH SENNA LEAVES ARE OBTAINED.

By J. B. Batka.

As I intend to notice only the officinal sorts of senna-leaves, as being by their medicinal qualities best known and distinguished, I may be permitted to make a separate genus of *Senna*. The fact that none of the officinal sorts actually possess the glands mentioned by Forskäl and De Candolle, and that the genus *Senna* is distinguished from the other species referred by De Candolle to *Cassia* by the peculiar form of the *fruits* (folliculi), their *dissepimenta* and *seeds* will justify this proceeding.

Although senna is one of the best known and frequently employed medicines, botanists have not yet succeeded in making out the confused synonyms of the genus; and I myself should not have been able to have done so but for the abolition of the monopoly which the government of Egypt held for so many years. This has given me the opportunity of becoming separately acquainted with the different species and their fruits, of which formerly Alexandrian senna was made up at Boulac, near Cairo. For several years past the various sorts of senna-leaves with their follicles have been obtained unmixed directly from the places where they grew. Formerly the follicles were in part picked out and sold separately under the name of *Folliculi Sennæ;* and as it was not known to which leaves these isolated follicles belonged, no judgment could be formed of those which were found in Alexandrian senna. The following senna-leaves are imported to us from the East:

1. From Alexandria, under the name of *Apalto Senna*, the mixture consisting of three different species of senna and of the *Cynanchum Argel*, discovered by Nectoux and Deile.

2. From Mecca, by way of Alexandria, the well known narrow-leaved *Senna*.

3. From Syria, by way of Aleppo, the obovate leaves.

4. From Tripoli, the mixture of two species, first discovered by Nees and myself.

5. From the East Indies, the narrow-leaved wild-growing Mecca Senna, and the Tinevelly Senna grown from seeds.

The description of Alexandrian senna is found in every class book. But as it contains the three principal species of all officinal senna-leaves, it is important that I should give their botanical analysis and their special diagnosis; and also examine the prevailing opinions respecting them.

Having, during my long residence at Trieste, bestowed great attention upon this subject, and afterwards received the communication of my lamented friend Sieber, and seen with great interest the beautiful specimens of Ehrenberg, in Berlin, where I was assisted by the advice of my friend Hayne, and having lately examined in Paris Delile's plant in company with Delile himself, I felt the importance of also inspecting Forskäl's plants in Copenhagen. My late friend Professor Schumacher, who resided there, had for some time been engaged with the examination of the same subject, and we examined together the specimens from Forskäl's own hand, contained in the herbarium of Vahl. There we found *Cassia Senna*, identical with the plant of the same name, which I had seen in the herbarium of Linnæus; further C. *angustifolia*, Vahl, with the inscription C. *lanceolata*, in Vahl's own hand. This I found identical with that in Wildenow's Herbarium, in Berlin. The real *lanceolata* of Forskäl, however, we did not then find. During my last journey, I looked over the different species of cassia in the British Museum, and again found that the English are the best conservators of botanical treasure, for there I found, at last, to my great astonishment, what I had so much missed at Copenhagen, namely, a perfect specimen,

with fruits of the narrow-leaved senna, with the inscription C. *lanceolata*, (probably written by Sir Joseph Bankes, for by Forskäl's hand, C. *Senna* only was written on it.) *In this no glands could be discovered;* the leaves were somewhat more developed, but the whole habit perfectly agreed with that of C. *angustifolia*, Vahl. Besides this, there was also a specimen of C. *ligustrina*, Forskäl, with the glands, but without fruits. The dispute about the glands was the cause of the quarrel between Delile and De Candolle, and I cannot help agreeing with the first in denying the presence of glands in the officinal species; for, in spite of many and laborious examinations of whole bales of stalks, I have as yet not been able to discover among senna-leaves in *commerce* stalks with glands. It was necessary, in the first place, to establish this fact; and I corresponded, therefore, lately with Professor Vahl, in Copenhagen. He sent me a leaf of a plant possessing glands, C. *lanceolata*, Forskäl, and upon which Forskäl is said to have written with his own hand, *Surdud Senna.* Judging from the leaf, this plant is C. *ligustrina*, and it is very probable that Forskäl only wrote the above-mentioned name from oversight. It is, however, much to be regretted that this mistake crept into his *Flora Ægypt. Arabica*, and thus to the detriment of science, has been promulgated in every manual. The leaves of this C. *ligustrina* are very like those of Tinevelly senna, but somewhat more pointed and (almost imperceptibly) finely ciliated at the edge. The fruit is a narrow, scymitar-shaped, curved, yellowish pod (*legumina linearia incurva*,) very different from the officinal folliculi, and consequently not belonging to *Senna.* The fruit I saw for the first time in the specimen preserved in the Linnæan herbarium. Whoever has not seen and closely examined this plant, may easily mistake it for the full-grown Mecca and Tinevelly or East India senna. The mistake of Forskäl, therefore, (who had manifestly not seen and collected this plant when in fruit) may be readily excused; I cannot however, omit to *correct his mistake publicly.*

The glands of the C. *ligustrina* are quite different from those which Nees has erroneously depicted as glands in the C. *lanceolata*, in the collection at Düsseldorf, and which Nectoux and Persoon, who were equally mistaken, also declared to be glands; for they are not glands, but only two hairy stipulæ subulatæ at the basis of either side of the petiole of the C. *acutifolia*, as in many other species of *Cassia* and *Wisteria*. The glands of C. *ligustrina* and C. *glandulosa* L., on the other hand, arise at ¼ or ½ inch distance from the bases, on the common petiole, from the hairy midrib, in the form of a small fungus of the size of a pin's head, with a yellowish stem and brown cap.

If we now pass to the principal question, Forskäl's plant as C. *lanceolata*, we find that, (taking the specimen in the British Museum as the prototype,) it is identical with C. *angustifolia*, Vahl, and with Mecca and Indian senna-leaves, and I therefore declare it to be *Senna angustifolia*, which, as is well known, forms a part of the Alexandrian senna-leaves. *By this, therefore, the incorrect descriptions of Forskäl, in his "Flora Ægypto-Arabica," the less accurate synonym C. lanceolata, and above all, the error of De Candolle, respecting the glands, are got rid of; for C. acutifolia*, Delile, cannot be confounded with it without further mistaking it for *Senna acutifolia*. It remains the original *officinal* species of Sennaar, and is distinguished by the more elliptic form of the slightly hairy midrib, and by its peculiar smell and acrid taste. I examined Dr. Kotschy's very perfect and beautiful specimen, sent in 1840 from Sennaar to the British Museum, the smooth, brownish-green follicles contained between the dissepiments showing wrinkled seeds with yellowish seed-lobes and an enamel-like coating. Nees, in the collection of Düsseldorf, has erroneously mixed this species with C. *Senna* and C. *lanceolata*, and thus only increased the confusion of the synonyms of these otherwise beautifully and correctly depicted plants.

C. *Senna* of Linnæus is the third species of which the Alexandrian leaves are composed, and, out of respect for the authority of old Linnæus, by many ancient botanists considered as the prototype of the same. I can only consider it as the vehicle of all mistakes, which this name is intended to conceal. Most previous botanists have done the same (as Forskäl did with *ligustrina* and *lanceolata*) when tired of further examination. I have found it identical with C. *obtusa*, Roxburgh, *obovata*, Colladon, *obtusata*, *et obovata*, Hayne. The leaves of this species vary much in form; all the more fully grown leaves are at the top broadly blunted (*obtusata*) and retuse (*retusa*) whilst the younger leaves present this characteristic less distinctly, and are more ovate (*subovata*, *obovata*.) In commerce, this species has been very correctly named from this latter character, and I shall therefore call it *S. obovata*. The climate in which the *Senna obovata* grows, imparts to the leaf its peculiar consistency. The color of the leaves is brownish-green; those from Tripoli have a more delicate parenchyma than those from Saida and Aleppo; those from Senegal are thicker and more like leather. The smell of these leaves is inconsiderable; their taste, when chewed, mucilaginous and herbaceous; the dark-green follicles, when ripe, have a contracted kidney-like form; the unripe ones, however, have a more bottle-gourd, rounded form, and after the production of the seeds, which are somewhat torulose, have crest-like verticle protuberances projecting in the middle, and the seeds have very yellow-colored cotyledons.

That *Cynanchum Argel* materially increases the smell of the Alexandrian leaves, and is, therefore, intentionally mixed with them, is now an established fact; the pale-green leaves, whitish blossoms, and blackish fruit, of this plant, which are found among the so-called officinal leaves (as imported by us,) sufficiently mark their presence; and in order to suppress entirely this adulteration, I propose to cease

buying this Alexandrian commercial sort, till the practice is given up.

The narrow-leaved *Mecca senna*, which I have designated *Senna angustifolia*, is mixed with the small felty leaves of a tender plant, which I discovered in it some time since; and having recently received it from Delile as a variety of his C. *acutifolia*, I now take the liberty to introduce it as *Senna tomentosa.* This plant is no shrub, but like the Mecca and Tinevelly senna, merely an herbaceous plant. It has, therefore, only very delicate, but not ligneous stalks, like the *Senna acutifolia* and *obovata.* It is impossible, in my opinion, to regard this *Senna tomentosa* as a variety of *acutifolia*, for not only the felt-like leaves and fruits, but also the whole habit, is much more delicate and different, while the leaves are *considerably smaller*, and of a more oval form, which certainly possesses a small point (*mucro*) but no bird's-tongue-like appearance, as *Senna acutifolia.* Delile accounts for this, by assuming that the hairy character is neither constant, nor a safe criterion when the leaves and fruits are perfectly developed, and I myself do not consider it of great importance; but still in one and the same bale of Mecca Senna these leaves and fruits are found in several stages: and although the fruits, *if the seeds be perfectly ripe*, having actually lost the blackish color and part of the yellowish hair, still their upper suture always remains, as I have had frequent opportunity of satisfying myself, and, contrary to what is the case with the follicles of *Senna acutifolia* and *angustifolia*, distinctly ciliated with fine hair; and likewise the leaves, even when full grown (5—6‴ long and 3—3$\frac{1}{2}$‴ broad) are always felt-like and furnished with whitish hair. Darnaud sent this plant in 1843 to Delile from the valley of Dumrich in Nubia; but Boré had previously discovered it in Arabia, and the bale which I examined had been imported from Yemen, (in Arabia.) At first I took these delicate small hairy leaves to be another sort (*Tephrosia Apollinea*)

found in the Tripoli Senna, and which I had already met with in 1828; but I soon convinced myself, by examining the fruits mixed with it, and comparing it with Darnaud's specimen, that it was a real *senna.*

The Tripoli leaves consist, according to my examination, of *Senna acutifolia*, *S. obovata*, a trifling addition of *S. angustifolia*, and occasionally, as I found in 1828, and again in 1840, of the leaves of *Tephrosia Apollinea*, which, not being as constant as the adulteration of the Alexandrian leaves with *Cynanchum Argel*, I am inclined to consider as accidental. This plant is perfectly well figured in Delile's *Flore d'Egypte*, page 144, and described by him as *Galega;* the delicate hairy leaves are soft, green, oblong, ovate, and, therefore, not easily to be distinguished from those of *S. obovata*, if this were not facilitated by the narrow, yellowish, hairy pods, which I found among them. I sent it at that time to Nees, who confirmed my views, and mentioned this adulteration at the meeting at Düsseldorf.

I now come to the fifth commercial sort, viz:

The East India senna, which I consider as identical with that cultivated by Mr. Hughes, in Tinevelly, near Calcutta; and, therefore, in consonance with Royle and Wallich, I admit it as *Senna angustifolia*, the first of whom showed it to me beautifully drawn as *lanceolata*, Forskäl, in his *Illustrations of the Botany of the Himalaya Mountains*. It appears that by care and cultivation, the leaves of *S. angustifolia* here become broader and longer, for this Tinevelly senna is exactly one-third wider and longer than the leaves of the same species of senna growing wild in the East Indies and in Arabia. The color is also deeper green, which, however, arises from the care taken in drying them; for whilst the senna in Tinevelly is cultivated, and the leaves, like those of tea, gathered only when perfectly developed, the Indian atherer mows the wild-growing leaves (whilst yet imperectly developed, and therefore whilst narrower and smaller,) like hay with us, and leaves them all exposed to

the air and moisture; and whilst they are yet for the most part not dry, they are pressed together in bales, where they undergo a fermentation. This is distinctly shown by the burnt black, and, by the oxidation of the Cathartin, yellow leaves. The proof that this color is not the natural one is furnished by the fact, that the above-mentioned Tinevelly leaves, and the more carefully collected pure Yemen and Mecca leaves, which come from the same plant, are, since the abolition of the monopoly, received direct from these parts, in a more beautiful condition than were formerly procured by way of Cairo. They are also justly to be preferred to those East India yellow leaves; for although Pomet, in his work written in 1688, prefers the yellowish senna leaves to all others, still he would have rejected them, because they represent as narrow-leaved senna (*de la pique*) the Mecca leaves, against which he pronounces, without further examination, the anathema, as well as against the green leaves *(obovata)* from Tripoli and Saida, with the intention of praising above all others the Alexandrian leaves, which were at that time probably not so much mixed with other leaves and the Cynanchum as now.

It was only after long continued personal examination and inspection of the dried original plants, that it has been possible to elucidate finally this obscure part of the materia medica; and I shall consider myself very happy if I have succeeded in this task.

Senna.

Familia *Leguminosæ*, tribus *Cassiæ*. *Decandria Monogynia*. Calyx pentaphyllus, petala quinque æqualia; antheræ supremæ tres steriles, infimæ tres radiatæ filamentis longioribus incurvis, petiolis *eglandulosis, foliolis basi obliquis*. Folliculi oblongi vel reniformes, lati, plano-compressi, margine membranaceo. *Semina* (parietalia, cum *dissepimentis*) cordata, tunica torulosa. *Podospermio*, sutura supera et hilo ovali conjuncto, cotyledonibus flavis, radicula et plumula coronatis.

1. S. OBOVATA: foliis pinnatis, tri-quatuor vel quinquejugis, foliolis *obovatis retuso-rotundatis,* mucronatis, basi angustioribus; folliculo supra semina verticaliter interrupto *cristato.* Seminibus *verticaliter torulosis.*

Syn: *Cassia senna,* Linnæi, sp. pl. 1, p. 559. Nectoux *Voyage d'Egypte,* tab. 1, page 19. Burmaan, *Flor. Ind.,* page 96, t. 33. Sieber *Flora Ægyptiaca,* et Delile *Flore d'Egypte,* fol. 420.

Cassia obovata et *obtusata,* Hayne. *Düsseldorf Abbild· Consp.* 347.

Cassia obtusa, Roxburgh, *Flor. Ind.,* 2., p. 344.

Cassia portoregalis, Bancroft.

Cassia Senna, Lam. ill. 1, 332.

Cassia obovata, Colladon, *Hist. des Cass.,* p. 92.

Cassia Senna Italica, Linn., sp. pl. ed. ii., i. p. 539.

Frutex habitat in Syria, Ægypto, Senegalia, Tripoli et India.

Senna de Aleppo in commerc. dicta.

2. SENNA ANGUSTIFOLIA. Foliis pinnatis, quinque septem-jugis, foliolis *angusto-lanceolatis,* glaberrimis subæqualibus, folliculis planis compressis oblongis et reniformibus.

Synon.—*Cassia angustifolia.* Vahl. Symb. Willdenow in *Herb. Berolin.*

Cassia Senna, Dr. Wallich, missa in *Horto Botanico Calcuttæ Colitar.*

Cassia Indica, Schumacher, *Plantelare,* t. i., page 577.

Cassia elongata, Lemaire Lisancourt.

Cassia acutifolia, Düsseldorfer Sammlung *exclus. Synonymis Consp.,* 346.

Cassia lanceolata, Forskäl, in Mus. Britan., exclus. description in *Flor. Ægypt. Arab.,* page 85, No. 58.

Cassia lanceolata, Dr. Royle, in the *Illustration of the Botany of the Himalayan Mountains,* tab. 37.

Cassia lanceolata, Herb. Wightii, No. 654 in Mus. Brit.

Habitat in Arabia, in Lohaya, Mecca, Yemen, et in India. In Calcutta, Tinevelly prope colitur.

Senna de Mecca in commerc. dicta.

3. Senna acutifolia. Foliis pinnatis quinque-jugis stipulis linearibus subulatis et pilosis ad basin petiolorum, *foliolis ovato-acutis* æqualibus nervo medio in adolescentibus piloso; folliculis oblongis plano-compressis.

Synonym: *Cassia acutifolia.* Delile *Flore d'Egypte.*

Cassia lanceolata. Düsseldorf, Sammlung, *exclus. Synonym. Consp.*, 345.

Cassia lanceolata. Dr. Kotschy, in Mus. Brit., No. 315.

Frutex habitat in Ægypti et Sennaar. *Cassia Alexandrina.* Miller.

Senna Alexandrina et officinalis in com. dicta.

4. S. tomentosa. Foliis pinnatis quinque-jugis foliolis parvis *ovoto-oblongis,* pilosis mucronatis, folliculis adolescentibus nigris, velutinis; maturis sutura superiori pilis albidis ciliata.

Synonym; *Cassia ovata,* Merat et Lens? *Cassia acutifolia* varietas *tomentosa* Delile.

Habitat in Arabia et Nubia, inter folia *Sennæ Meccensis* ab aucture detecta et a clariss. Boré in Arabia et a clariss. Darnaud in Valle Dumrich in Nubia collecta.

Sennæ de Mecca in commercio dicta.

ART. XC.—ON THE PREPARATION OF HYDROBROMIC AND HYDRIODIC ACIDS.

By C. H. Mène.

Hitherto hydrobromic and hydriodic acids have been prepared by decomposing the phosphorets of bromine and iodine by a small quantity of water. Now without mentioning the considerable loss of substance, the serious and frequent accidents which occur in this reaction frequently prevent chemists from preparing these gases, and consequently from studying their properties. The means recently proposed, as the essential oil of lemon, napthaline, being either rare, expensive or of difficult preparation, I have considered it of sufficient importance to describe a new method of preparation, which I have recently employed with success, and which presents no danger, and is not accompanied by any loss.

To liberate hydrobromic acidgas, I employ the crystallized hypophosphite of lime obtained in the preparation of phosphuretted hydrogen from phosphuret of calcium. It is placed in a flask or retort with a small quantity of water; after which I add, by means of a long funnel, some liquid bromine; the reaction takes place instantly, without the assistance of heat, and hydrobromic acid is disengaged, and may be collected over mercury. It is merely requisite to place in the neck of the retort or the flask some pieces of cotton or of amianthus, in order to retain any bromine vapor which might be volatilized by the heat. The reaction of the bromine upon the hypophosphite of lime in presence of water will be easily understood; the water is decomposed, 4 parts of oxygen pass to the hypophosphite of lime, converting it into neutral phosphate, and the 4 parts of hydrogen are transferred to the bromine, forming hydrobromic acid:—

$$4Br + PhO, CaO + 4HO = PhO^5 CaO + 4HBr.$$

To prepare hydriodic acid, I use the same salt, and follow the same mode of preparation, only it is requisite to assist the reaction by a little heat. The decomposition is similarly expressed by the equation

$$4I + PhO,CaO + 4HO = PhO^5 + 4HI.$$

Sulphite of soda may likewise be employed for the preparation of these two gases. With this salt it is not necessary to add water, as in general the crystals of commerce contain a sufficient quantity; I merely dip them in water, and then add immediately the bromine or iodine. It is necessary to assist the reaction by heat. The reaction is very simple. The bromine or iodine decomposes the water in presence of this salt; 1 equiv. of hydrogen is transferred to the bromine, forming the gas in question, and the oxygen converts the sulphite into sulphate:—

$$SO^2, NaO + HO + Br \text{ or } I = SO^5\ NaO + BrH \text{ or } IH.$$

It needs scarcely to be observed that the last method is preferable, as the sulphite of soda is commonly met with in commerce, whilst the preparation of the hypophosphite of lime is very troublesome. In the course of two weeks I have disengaged from 20 to 25 litres of these two gases without having met with the least accident; whilst with the old process I have frequently had explosions, which would certainly have produced serious consequences if the quantities operated upon had been at all considerable.

The proportions to be employed for the preparation of these two acids are—

By the hypophosphite of lime.		By the sulphite of soda.	
Water	1	Water	1
Iodine or bromine .	5	Iodine or bromine . .	3
Hypophosphite in crystals	4	Crystallized sulphite of soda	6
	For 10 parts.		For 10 pts.

Chem. Gaz. from Comptes Rendus.

ART. XCI.—ON THE ESTIMATION OF SUGAR OF MILK, AND THE DETERMINATION OF THE RICHNESS OF MILK.

By M. Poggiale.

None of the processes hitherto known being capable of furnishing, in a rapid and accurate manner, the determination of the richness of milk, I thought that if it were possible to estimate quickly one of its necessary constituents by a process of measurement, without using the balance, the problem would be solved. I think I have obtained this result by determining the proportion of sugar-milk.

Several specimens of pure milk, which I obtained for the purpose, were submitted to chemical analysis, and the following represents the mean of ten results :

Water	862.8
Butter	43 8
Sugar of Milk . . .	52.7
Caseine	38.0
Salts	2.7
	1000.0

Thus, according to my experiments, one thousand parts of milk contain 52.7 parts of sugar. M. Boussingault, in a series of observations, found a mean of 50; a difference no doubt resulting from a different mode of operating. The quantity of sugar contained in milk is therefore considerable, and is subject to but slight variation.

The process which I propose is an application of that of M. Barreswill for the purpose of estimating the sugar of milk. This kind of sugar, in common with grape sugar, reduces the salts of copper, and it may be easily estimated by applying this reaction. The proportion of salt of copper decomposed will give the quantity of sugar of milk.

Preparation of the Test.—It is prepared by adding bitartrate of potash to a solution of sulphate of copper, and dissolving the precipitate which is formed by means of

caustic potash. We have then to determine with care the strength of the alkaline solution, which is effected by ascertaining the quantity of sugar required to decolorise a given quantity of the liquor. It is important to observe, that in this operation sugar of milk, and not cane sugar, is to be used.

I have made a few experiments with the view of establishing a test liquor, the value of which shall be known. The following proportions have always afforded a liquor twenty cubic centimetres, of which correspond to two decigrammes of whey:

Take of Crystallised sulphate of copper . . .	10	parts.
Ditto bitartrate of potash . . .	10	"
Caustic potash	30	"
Distilled water	200	"

The liquid, after being filtered, is limpid, and of an intense blue color.

Preparation of the Whey.—In estimating the sugar of milk it is necessary to separate the fatty matter and the caseine by coagulation. This is easily effected by putting fifty or sixty grammes of the milk into a flask, adding a few drops of acetic acid, and then raising the temperature to 40° or 50° Cent. A transparent liquid will be obtained by filtration. According to my experiments, 1000 parts of milk yield 923 parts of whey, 1000 parts of which latter contain about 57 parts of sugar of milk.

The testing of the Whey.—Twenty cubic centimetres of the liquid to be tested is transferred by means of pipette to a flask, which is preferable to a capsule because the change of color can be readily perceived. The liquid is to be brought to the boiling point. On the other hand, a burette, each division of which is the fifth of a cubic centimetre, is to be filled with the whey; and this is to be added, drop by drop, to the test liquor, keeping it continually agitated and heated from time to time, until the blue color has entirely disappeared. In the first instance, a yellow precipitate of hydrated suboxide of copper is formed, which

speedily becomes red, and is deposited in the flask. When the operation is finished, the quantity of whey which has been used is observed, and by a rule of proportion the weight of sugar in a thousand grammes of whey is determined.

We have here assumed that a thousand grammes of whey contains fifty-seven grammes of sugar, but it will be necessary to make allowance for variations to the extent of a few grammes. Most of the frauds which are practised with reference to milk would be discovered by estimating the quantity of sugar present, as they would be effected by the addition of water. Nevertheless, it might happen that the cream was removed without any addition of water, or that grape sugar or sugar of milk was added. In these cases, I ascertain by a simple and expeditious process the quantity of fatty matter, by adding acetic acid to the boiling milk and agitating them together. After it has cooled, ether is added, which dissolves the butter; and the ethereal solution is evaporated when it yields the butter. It is sometimes desirable to verify the results by repeating the estimation of the sugar of milk; and the arrangements being prepared, and the quantities approximatively known, this may be done in a few minutes.—*Pharm. Journ. from Journ. de Pharm.*

ART. XCII.—ON THE PRODUCTION OF ARTIFICIAL OIL OF RUE FROM COD-LIVER OIL.

By Dr. Rudolph Wagner.

It is well known that cod-liver oil, when mixed with strong sulphuric acid, furnishes at first a purple-red tenacious mass, which color almost immediately passes into a brownish red, and then into a dark-brown. If this mass be supersaturated with a caustic or carbonated alkali or an alkaline earth, and then heated, a penetrating odor of the essential oil of rue, (*Ruta graveolens*) is disengaged. To

procure the odoriferous substance in sufficient quantity for analysis, I mixed pretty considerable quantities of cod-liver oil and sulphuric acid, then saturated with potash or lime, and distilled with water. The water which passed over was turbid, and possessed an excessively strong odor of rue; but only in a few cases was I able to perceive any drops of oil on its surface. Other experiments, in which I treated the fatty acids separated from the saponified cod-liver oil in a similar manner, furnished no better results. Fish oil and train oil from train-oil soap, submitted to a similar treatment furnished the same result.

I am not able to state more of the oil obtained, than that it is of a light yellow color, lighter than water, boils about 572°, and possesses the pure odor of the oil. With respect to the remarkable production of this oil from train oil by the action of sulphuric acid and subsequent saturation with a base, I may observe, that it certainly exists as such in the train oil, and cannot be considered as a product of decomposition by sulphuric acid. I found amongst the volatile fatty acids of cod-liver oil butyric and capric acids. Now, if we bear in mind that Gerhardt has recently asserted that the oil of rue is the aldehyde of capric acid, $C^{20} H^{20} O_2$, which he rendered probable by converting it by treatment with nitric acid into a different acid of the formula $(C^2 H^2)^n + 4O$, pelargonic acid, we may be allowed to conclude that the sulphuric acid enters into a combination with the aldehyde of capric acid, or rather with the oxide of caprinyle, $C^{20} H^{19} O$, and that this compound is decomposed on the addition of a base, when aldehyde separates. This aldehyde, on becoming rancid, that is by the absorption of 2 equivs. oxygen, forms capric acid, $C^{20}H^{19}O^3 + HO$. That the latter does not give rise to the production of the oil of rue is shown from the fact, that the capric acid is not at all altered by mixture with sulphuric acid.

The characteristic odor of the oil of rue or of the aldehyde of capric acid furnishes us with the means of detecting the

presence of capric acid, or rather of the aldehyde, which always accompanies it. For instance, when fresh butter is heated with concentrated sulphuric acid, and potash is added in excess to the melted brown-red mass, the odor of the oil of rue is distinctly perceptible amidst the penetrating odors of the volatile fatty acids contained in the butter. I obtained the same odor by submitting to a similar treatment various sorts of fish oil, a piece of herring, several kinds of cheese, &c.

I will mention, in conclusion, that a mixture of train oil and sulphuric acid saturated with lime having been kept several days before distillation, the distillate consisted of a turbid water, which no longer possessed the odor of oil of rue, but distinctly that of peppermint. This circumstance is interesting on account of the isomerism of the oil of rue with the camphor of the oil of peppermint.—*Chem. Gaz., from Journ. für Prakt. Chem.*

ART. XCIII.—MIXTURE OF CAMPHOR AND CHLOROFORM.

Messrs. J. & H. Smith, of Edinburgh, have discovered a valuable means of administering camphor in a perfect and concentrated state of solution; which consists in uniting it with chloroform, according to the following formula: solid camphor, three grammes; chloroform, one gramme. The solution occurs rapidly and completely. It is a truly curious fact which, perhaps, has no analogy in chemistry, where the relation of the solid to the liquid solvent is so great. The addition of a certain proportion of water, emulsinized with yoke of egg very fresh, does not cause the separation of particles of either camphor or chloroform. If you add to this emulsion a quantity of water sufficient to obtain a mixture weighing 120 grammes, (about 4 ounces) each tea-spoonful of the mixture contains about 25 centigrammes (3¾ grains) of camphor.

The authors have placed this new camphorated mixture in contact with various pharmaceutical preparations, to see if any decomposition ensued. They have stated a certain number, in the presence of which camphor is maintained in a state of perfect solution; these are, a saline solution containing common salt and phosphate of soda, or an alkaline carbonate, a solution of muriate of morphia and sulphate of zinc, volatile alkali, acid liquids, and a weak solution of acetic, or muriatic acid. In the presence of water alone the mixture deposits camphor gradually in few days but this re-dissolves promptly by slight agitation.*—*Jour. de Pharm.*

ART. XCIV.—NATIONAL CONVENTION FOR REVISING THE PHARMACOPŒIA OF THE UNITED STATES.

The Convention for revising the Pharmacopœia, which met in Washington in January, 1840, adopted the following resolutions:

"1. The President of this Convention shall, on the first day of May, 1849, issue a notice requesting the several *incorporated State Medical Societies*, the *incorporated Medical Colleges*, the *incorporated Colleges of Physicians and Surgeons*, and the *incorporated Colleges of Pharmacy*, throughout the United States, to elect a number of delegates, not exceeding three, to attend a general convention to be held at Washington on the first Monday in May, 1850.

* Some of our physicians have prescribed a mixture of chloroform with oil of camphor—that obtained from the Dryobalanops camphora. This camphorous volatile oil is preferable to camphor alone for emulsionizing chloroform, and appears to have the medicinal properties of camphor, of which it is a strong solution. One part of chloroform, by measure, will form a perfect solution with 3 parts of camphor, by weight, and when the solution is rapidly effected, the temperature rises instead of diminishing, which indicates some chemical reaction.—Ed.

"2. The several incorporated bodies, thus addressed, shall also be requested by the President to submit the Pharmacopœia to a careful revision, and to transmit the result of their labours, through their delegates, or through any other channel, to the next Convention.

"3. The several medical and pharmaceutical bodies shall be further requested to transmit to the President of this Convention the names and residences of their respective delegates as soon as they shall have been appointed, a list of whom shall be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1850.

"4. In the event of the death, resignation, or inability to act of the President of the Convention, these duties shall devolve on the Vice President; and, should the Vice President also be prevented from serving, upon the Secretary, or the Assistant Secretary, the latter acting in the event of of the inability of the former."

In compliance with the foregoing resolutions, the undersigned, having been informed by the President of the late Convention, Dr. Lewis Condict, that he would be unable, from indisposition, to perform the duties assigned to him, gives notice, to the several Medical and Pharmaceutical bodies enumerated in the first resolution, that a Convention for the revision of the National Pharmacopœia, will meet in the city of Washington, on the first Monday in May, 1850. The undersigned also requests of the several bodies referred to, that they will fulfil the wishes of the Convention, as set forth in the second resolution; and, further, that they will transmit to his address, on or before the first of March next, the names and residences of the delegates whom they may appoint, in order that a list of them may be published, as directed in the third resolution.

GEO. B. WOOD, M. D.,
Vice President of the Convention of 1840.

Philadelphia, May 1st, 1849.

MINUTES OF THE PHILADELPHIA COLLEGE OF PHARMACY

At a Stated Meeting of the Philadelphia College of Pharmacy, held at their hall, Ninth month 24th, 1847. Present 15 members. Vice President Samuel F. Troth in the Chair.

The minutes of the last stated meeting were read and adopted.

The minutes of the Board of Trustees were read, detailing the interesting proceedings of that body for the last six months. Through their minutes, the College was informed that Charles L. Bache, a graduate of the Institution, now a resident of San Francisco, had been elected an associate member.

They also recommend Thomas Gegan and Frederick L. John, to the College, as worthy of resident membership.

Their minutes gave information that the following named candidates had applied for the Diploma of the College. They were examined by the Professors and Examining Committee, and recommended for graduation, which was unanimously agreed to by the Board, and they were accordingly declared duly elected Graduates of the College, viz:

Charles L. Bache,	Thesis on	Ficus Carica.
Samuel L. Costill,	"	Sanguinaria Canadensis.
Isaac W. Stokes,	"	Aralia spinosa.
T. Morris Perot,	"	Chloroform.
Avery Tobey,	"	Prinos Verticillatus.
Charles Hartzwell,	"	Asclepias tuberosa.
Samuel Hastings,	"	Anthemis nobilis.
Oscar Steele,	"	Aralia spinosa.
Wm. W. D. Livermore,	"	Cornus Florida.
Edmund A. Crenshaw,	"	Capsicum.

On motion, the College proceeded to the election of Thos. Gegan and Frederick A. John. The Chairman appointed Jacob L. Smith, teller, who reported they had each re-

ceived the requisite number of votes, and they were accordingly declared duly elected.

The minutes of the Board further informed, that a letter had been received from Dr. John C. Warren, of Boston, President of the American Medical Association, accompanying a resolution of that body expressive of satisfaction at the intention of this College to prepare and publish some plain directions for detecting adulterated drugs and medicines, and expressing a hope that a copy would be furnished to its next annual meeting. The proceedings of the Board were approved by the College, and the committee charged with this subject were encouraged to pursue their labors.

A member of the College communicated the fact that the Code of Ethics which were directed to be forwarded to the American Medical Association, held in Baltimore, in 1848, had been distributed among its members, and had been entered upon the minutes of that body.

The proposition to alter law 5, sec. 2, referred from last stated meeting, was fully discussed by several members, and several modifications were proposed.

It was believed by many members that the time had arrived when the standard of professional attainment should be elevated, and that those only who had availed themselves of the advantages of our School of Pharmacy, and submitted themselves to an examination for its diploma, should be entitled to the privileges of membership in the College.

The importance of the subject requiring further deliberation, it was, on motion,

Resolved, That a Committee of five members be appointed to to consider the subject in its various bearings, and report to an adjourned meeting of the College. The Chairman nominated the following members, viz: Ambrose Smith, Charles Ellis, Thomas P. James, Wm. Procter, Jr., and John H. Ecky.

The Committee on Latin Labels made the following report, which was directed to be placed on the minutes.

To the Philadelphia College of Pharmacy.

The Committee on Latin Labels respectfully report, that in accordance with the resolution of the College, they have revised the last edition of the labels, made such additions as they deemed advisable, and in order to give greater value to the book, as well as to supply a want which has long existed, they have at very considerable expenditure of time and labor, collated a set of labels for materia medica specimens, and have had them printed with the book. The committee believing that the demand will justify it, have caused fifteen hundred copies to be printed, which are now in course of sale.

In reference to the financial concerns of the committee, they will state that they have sold already about $300 worth of the labels, which sum, in connection with the funds in possession of the treasurer of the committee, are just about sufficient to cover the expenses of the edition.

CHAS. ELLIS,
WM. PROCTER, JR.,
On behalf of the Committee.

The Committee on the Adulteration of Drugs, and on the preparation of a Book of Directions for detecting adulterations in drugs and medicines, not being ready to report, were further continued.

A resignation of William H. Schively, accompanied by a communication from the Treasurer, informing that his certificate was returned and arrearages paid, was read and accepted.

To the Philadelphia College of Pharmacy.

The Committee appointed in Third mo. 1847, "To revise the Pharmacopœia, and report on such changes and amendments as they may think proper, and submit the result of their deliberations to the College at least six months before the sitting of the Convention," respectfully report:

That they have finished the revisionary labors committed

to their charge, except that portion which relates to engrossing and arranging the reports of the sub-committees, which will require the leisure time of the secretary during several weeks to accomplish. As the *convention* commences its sittings in May 1850, the committee ask to be continued to report in full to a Special Meeting to be held on the 5th of November next, at which time, if it pleases the College to appoint it, they hope to be entirely prepared.

In reference to the labors of the committee it may be proper to state, that soon after their appointment, they were convened by order of the Chairman, and a regular organization entered into similar to that adopted by the Committee of Revision in 1840; but as several years were to elapse before the report was to be presented, it was deemed most favorable to the object in view to defer the action of the committee to a time approaching that period; consequently they did not commence their labors in earnest until the 23d of April of the present year. Since that time they have proceeded regularly with the work, the three sub-committees reporting monthly to the general committee.

It should be stated that two members of the committee, viz: William Hodgson, jr., and Henry W. Worthington having resigned, owing to press of engagements; Charles Bullock and Alfred B. Taylor were appointed by the committee to fill the vacancies thus occasioned.

In conclusion the committee will reiterate their request to be continued to report to a special or adjourned meeting of the College to be held on the 5th of November.

D. B. Smith, Jacob L. Smith,
W. Procter, jr., Ambrose Smith,
Wm. J. Jenks, Charles Ellis,
John H. Ecky, Alfred B. Taylor,
Robert Bridges, Jos. C. Turnpenny,
Thos. P. James, Joseph Carson,
Chas. Bullock, Edward Parrish,
Dillwyn Parrish, Committee.

Philadelphia, Sept. 24th, 1849.

On motion it was Resolved, that the Committee on the Pharmacopœia be continued, and that when the College adjourns, it shall adjourn to meet on the 5th of Eleventh month (November) next.

On motion it was Resolved that the Committee just continued be instructed to bring forward names of delegates to the Pharmacopœia Convention, to be held in Washington in 1850.

On motion it was Resolved to proceed with the election of eight trustees in place of those whose term of service expires by limitation. The Chairman appointed tellers, and the College proceeded to an election, when it was declared the following members were duly elected Trustees, viz :

Thos. P. James,	John Harris,
Jacob L. Smith,	Wm. J. Jenks,
Ambrose Smith,	Joseph Trimble,
Alfred B. Taylor,	Charles Bullock,

Then adjourned to the 5th of Eleventh Month next.

From the minutes,

Dillwyn Parrish, Secretary.

Editorial Department.

Adulteration of Drugs.—We have to acknowledge the receipt of a pamphlet, entitled a "Report on the practical operation of the law relating to the importation of adulterated and spurious drugs, medicines, &c., by M. J. Baily, M. D., Special Examiner of Drugs, &c., for the port of New York. Read before the New York Academy of Medicine, June 6th, 1849."

This report is in some respects a valuable one, as it exhibits to what extent the importation of deteriorated drugs has been carried on, even since the passage of an act for its prohibition. The author, Dr. Baily, states that

"The law took effect at this port on the 12th of July, 1848; and the following is a list of the more prominent articles of drugs and medicines, with the quantities and place whence imported annexed, which I have, during the months named, rejected under its provisions: to wit—

July, 1848,	7,581 lbs.	Rhubarb root,	from Canton.
August,	750 lbs.	Opium,	do. Marseilles.
do.	2,940 lbs.	Jalap root,	do. Tampico.
do.	2,249 lbs.	Rhubarb root,	do. London.
September,	646 lbs.	do. do.	do. do.
do.	1,414 lbs.	Gamboge,	do. do.
do.	545 lbs.	Rhubarb,	do. Hamburg.
do.	1,400 lbs.	Senna,	do. Leghorn.
do.	2,900 lbs.	Spurious Yellow Bark,	do. Bordeaux.
do.	875 lbs.	Rhubarb,	do. Canton.
do.	758 lbs.	Opium,	do. London.
do.	1,783 oz.	Iodine,	do. do.
do.	1,075 lbs.	Jalap,	do. Marseilles.
do.	4,275 lbs.	Rhubarb,	do. Vera Cruz.
October,	788 lbs.	Rhubarb,	do. London.
do.	227 lbs.	Myrrh,	do. do.
do.	13,120 lbs.	Spurious Yellow Bark,	do. Maracaibo.
do.	1,875 lbs.	do, do. do.	do. Bordeaux.
November,	412 lbs.	Myrrh,	do. London.
do.	1,280 oz.	Iodine,	do. Glasgow.
do.	860 lbs.	Opium,	do. Smyrna.
do.	185 lbs.	Rhubarb,	do. London.
December,	156 lbs.	Opium,	do. do.
do.	1,065 lbs.	Myrrh,	do. do.
do.	12,800 lbs.	Spurious Yellow Bark,	do. Santa Martha.
do.	392 lbs.	Jalap,	do. Vera Cruz.

January, 1849,	1,300 lbs.	Pectoral Paste,	from San Juan.
do.	2,071 lbs.	Rhubarb,	do. London.
do.	3,550 lbs.	Jalap,	do. Havanah.
do.	1,930 lbs.	Spurious Bark,	do. Antwerp.
February,	974 lbs.	Rhubarb,	do. London.
do.	1,992 oz.	Iodine,	do. do.
March,	1,104 oz.	Croton Oil,	do. do.
do.	4,894 lbs.	Senna,	do. do.
do.	1,345 lbs.	Spurious Bark,	do. do.
do.	404 lbs.	Opium,	do. do.
do.	1,150 lbs.	Valerian root,	do. Paris.
April,	425 lbs.	Opium,	do. London.
do.	1,273 lbs.	Myrrh,	do. do.
do.	550 lbs.	Jalap,	do. Vera Cruz.
do.	816 lbs.	do.	do. Tampico.
do.	1,450 lbs.	Sarsaparilla,	do. do.
do.	600 lbs.	Spurious Bark,	do. Barranquilla.

Together with smaller quantities of various articles which have been rejected from time to time, but which it is not necessary to enumerate here—making the entire amount, some 90,000 lbs. of various drugs, &c., which have, up to the present time, been refused."

After commenting on the valuable results of the law in question, as obtained at the port of New York, the author turns his remarks towards the business of domestic adulteration that is going on, and he is of opinion that the law of Congress is only the first step in the reforms which are necessary to rid our land of this monstrous evil. It was a common remark of those who were lukewarm towards the measure, that its passage would merely transfer the evil from Europe to our own shores, that the inducement to adulterate would be increased, and that yankee ingenuity would find a fruitful field for its exercise in this villanous business. However true these views, and we believe they are true to a great extent, it always was the design of the reform advocates to begin with the foreign adulteraters, because, so long as they were permitted to pour their vile productions on our shores, the very perfection of fair dealing, on our part, would be useless. Now that it is possible to begin right at home, let us use all our endeavors to do so. Now that good drugs only, it is presumed, enter our markets from abroad, let us leave no stone unturned to preserve their goodness unimpaired by sophistication. The best drugs are sufficiently prone to depreciate in value by the silent but sure influence of time and exposure to light, air, and variable temperature, without assistance from the villany of the unprincipled.

The action of Legislatures in a matter that must eventually rest with the conscience of individuals, is not always effective. Laws—good wholesome laws—will be hailed with satisfaction by all honourable members of both branches of the medical profession and by respectable

drug dealers. But of what avail are legal enactments, when those who put them in force are not capable of deciding just where they should be brought to bear? Of what use is the present congressional Act, if the Special Examiners are not qualified men? None—worse than none—for under the cover of their inspection worthless articles would be scattered over the land with the custom house stamp upon them. Nothing will be so effectual therefore, as the dissemination and cultivation of that practical knowledge which will enable the medical and pharmaceutical consumers, if we may so speak, to judge for themselves. Take the graduates of any one season, from even the best of our medical schools, and the majority of them will be found little versed in the practical means of detecting adulterations, or even in the knowledge derived from books. Take the majority of those who sell and prepare drugs, and it will be found that there is a great deficiency in this knowledge. We must, therefore, begin at home. Let every apothecary exercise himself in the critical examination of drugs, microscopically, chemically, and by their more sensible properties. Let every physician, old and young, give more attention to the sources whence he is supplied with drugs and medicines. Let physicians in general keep a wholesome watchfulness over the apothecaries that supply their patients and themselves. Not that querulous fault-finding suspicion, which is sometimes exhibited by medical men whose judgment is far short of their pretensions, but that brotherly watchful interest which is as fruitful in good, in medical morals, as in the ordinary economy of society. Finally, let the physician and the pharmaceutist keep each within his own sphere of action, and by mutual good feeling jointly advance the interests of their benevolent profession, whose kindly and soothing influence extends into every home over our wide spread country.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